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PALEONTOLOGY.—*New genera of American Middle Ordovician "Cystoidea."*[1]

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Extinct primitive pelmatozoan echinoderms known as "Cystoidea" are so well represented in the national collections that I have been able to complete a considerable manuscript on the Ordovician species alone. As some time must elapse before publication of this can be expected, it was thought wise to describe and illustrate the new families and genera in advance, especially since they will thus be available for consideration in the treatise on invertebrate paleontology now in course of preparation under the auspices of the Geological Society of America, the Paleontographical Society, the Paleontological Society, and the Society of Economic Geologists and Paleontologists. In naming the new forms I have been guided by my feeling that as a part of its history any special and rare group of organisms like the present one should have its distinguished students represented by generic names in their honor.

Subphyllum PELMATOZOA Leuckart, 1848

Class EOCRINOIDEA Jaekel, 1915

SPRINGEROCYSTIDAE, n. fam.

Eocrinoidea in which the top of the theca is tubelike (*Springerocystis*) but may also be platform-shaped (*Columbocystis*) or consist of five broad, short, recumbent arms (*Foerstecystis*).

Springerocystis, n. gen.

Top of theca elevated into a short, tubelike, oral protuberance, with its upper margin formed by five thin oral plates arranged in a small circle. Named in honor of Dr. Frank Springer.

Genotype, *S. longicollis*, n. sp.

Springerocystis longicollis, n. sp. Fig. 3

Theca elliptico-fusiform in outline below, terminating in an acute base of 2 mm and narrowing toward the top into an oral protuberance. Height 28 mm, greatest width 20 mm, anal area about 2.5 mm in diameter with its center 8 mm below top of oral protuberance.

Occurrence.—Blackriveran (Benbolt formation), Knoxville, Tenn.

Cotypes.—U. S. N. M. no. 93397.

Columbocystis, n. gen.

Summit of theca supports a flat platform composed of five thick, wedge-shaped, oral plates centering about a small oral aperture from which diverge one anterior and two lateral narrow food grooves, the lateral ones branching within 1 mm. The food grooves terminate in five facets on the lateral sides of the platform to which the brachioles were attached and curving upward became erect.

Genotype, *C. typica*, n. sp.

Columbocystis typica, n. sp. Figs. 1, 2

Theca oval, with a conspicuous flattened protuberance at the top; height 24 mm, width 18 mm. Anterior outline distinctly gibbous along its upper third, while the posterior presents its strongest convexity at midheight. From a lateral point of view the major axis of the theca appears oblique, extending from the upper anterior toward the lower posterior thecal border, and the upper flattened face of the food-groove platform slopes in the same general direction. The platform, 8 mm in width and 6.5 mm long from front to rear, consists of five plates 2.5 to 3 mm in height extending laterally beyond the upper margins of the supporting thecal plates. These plates form an elevation about 2 mm in height and 6 mm in diameter immediately beneath the platform.

[1] Published by permission of the Secretary of the Smithsonian Institution. Received June 19, 1950.

Occurrence.—Blackriveran (Benbolt formation), Rye Cove, Scott County, Va.

Cotypes.—U. S. N. M. no. 93407.

Foerstecystis, n. gen.

Like *Columbocystis* in general form but characterized by five relatively broad arms recumbent upon top of theca. Antanal side bears the strongly excentric base. Anal side very gibbous, especially toward lower end of theca, where it is angularly protuberant in a nearly horizontal direction. Plates much reduced in number and angulations connecting their centers correspondingly accentuated. Named in memory of Dr. A. F. Foerste.

Genotype, *F. obliqua*, n. sp.

Foerstecystis obliqua, n. sp. Figs. 11, 12

Theca irregularly rotund in outline; cotypes each about 10 mm high and 8 mm wide. Anterior side presenting a strongly convex vertical outline or hump, which reaches its maximum convexity about 6 mm from the anterior arm of the food-groove system. Posterior outline strongly protuberant near the midheight of the specimen, and still more so at its lower margin, where it terminates in a rounded point fully 8 mm distant from the pointed base of the specimen in a horizontal direction. Oral end of theca supports a sessile food-groove system, with five branches or arms, each 4 mm long and 2.5 mm wide spreading over an area 7 or 8 mm in diameter.

Occurrence.—Blackriveran (Benbolt formation), Knoxville, Tenn.

Cotypes.—U. S. N. M. no. 93400.

BATHEROCYSTIDAE, n. fam.

Proposed for the unusual new genus *Batherocystis*, named in memory of Dr. F. A. Bather. Family characters now necessarily those of the genus

Batherocystis, n. gen.

Theca oblong, strongly flattened, with the lateral margins of the flattened sides tapering decidedly toward the base. Anal opening relatively large, located along the upper part of one of the lateral margins.

Genotype, *B. appressa*, n. sp.

Batherocystis appressa, n. sp. Figs. 4, 5

Theca strongly compressed, presenting two flat sides connected by a narrowly rounded margin. Flat sides oblong in general outline but narrowed to a point slightly over 2 mm wide at the base. Height 25 mm, width 12 mm, thickness of theca, from one flattened surface to the other, about 1.7 mm. Anal area located on one of the narrowly rounded thecal margins, oval in outline, 2.5 mm in diameter vertically and 1.9 mm laterally, with its center 5 mm below the top of the theca.

Occurrence.—Chazyan (Lenoir limestone), Knoxville, Tenn.

Holotype.—U. S. N. M. no. 99394.

Class PARACRINOIDEA Regnéll, 1945

Family MALOCYSTITIDAE Bassler, 1943

Billingsocystis, n. gen.

Theca ovoid-oblong slightly flattened, with food-groove system imperfectly known but apparently confined to a single short, transverse, relatively deep, semilunate groove. No branches of this groove and no facets for the attachment of arms are present. Thecal plates many, all strongly ridged in a direction radiate to the angles. Columns cylindrical consisting of very thin columnals attached to the invaginated base. Named in remembrance of Elkanah Billings.

Genotype, *B. invaginata*, n. sp.

Billingsocystis invaginata, n. sp. Fig. 17

Theca oblong, moderately flattened laterally, base invaginated, with the column attached to its central part. Height 27 mm, greatest width 25 mm, least width 22 mm, depth of invagination about 2 mm. Anal area nearly 3 mm in diameter, with its center about 6 mm below the level of the top of the theca. Theca consisting of approximately 175 plates; 8 or 9 of these occur in a distance equaling the height of the theca. Ornamenting ridges radiating from raised centers of the plates toward their angles are narrowly angular, have sharp crests, and enclose intermediate flat triangular areas.

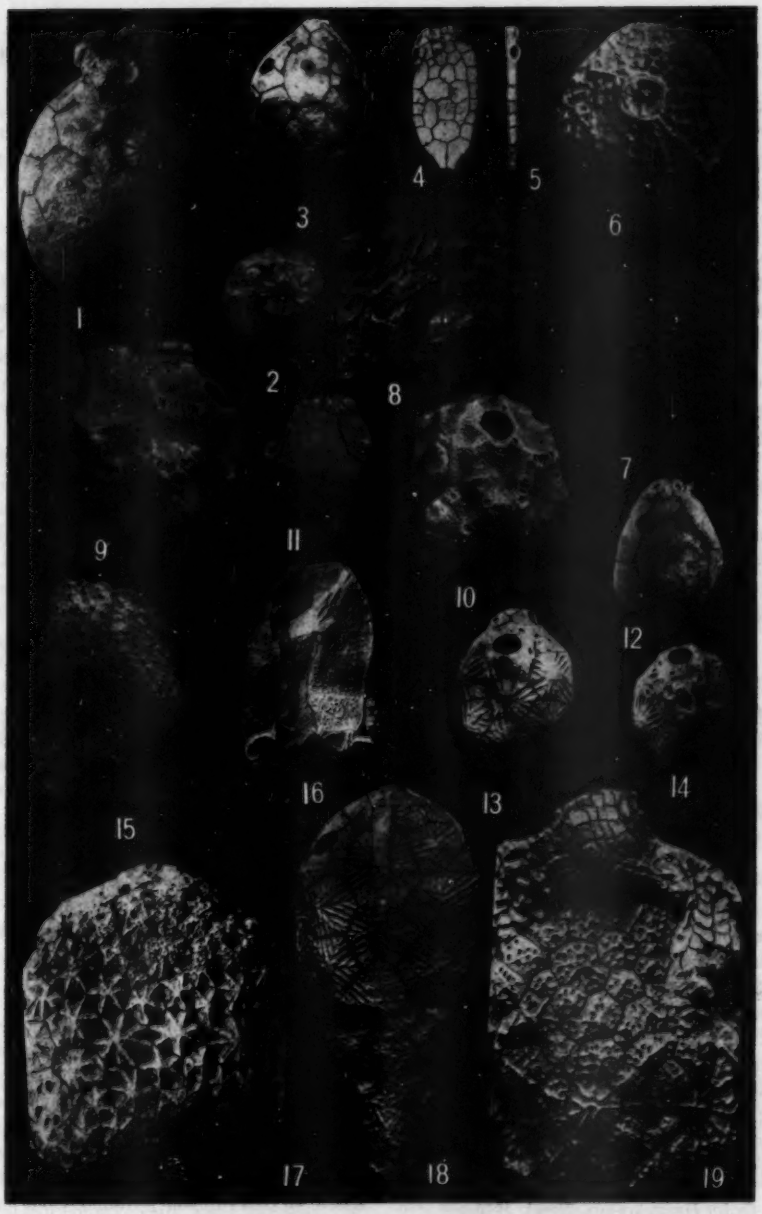
Occurrence.—Lower Trenton (probably Curdsville member), on the Versailles and Troy Pike, in Woodford County, Ky.

Cotypes.—U. S. N. M. no. 53110.

Family COMAROCYSTITIDAE Bassler, 1943

Schuchertocystis, n. gen.

Theca resembling a small *Amygdalocystites* but lacking recumbent arms. The base consists of three plates, two on the antanal and one on the anal side. Plate sutures crossed at right angles by long slits in the mesostereom that shorten at their passage through the hypostereom into ellip-



FIGS. 1–19.—1, 2, *Columbocystis typica*, n. gen. and sp., side view slightly tipped to show anal pyramid, × 2, and top view, × 1; 3, *Springerocystis longicollis*, n. gen. and sp., side view with anal opening to left, × 1; 4, 5, *Batherocystis appressa*, n. gen. and sp., side and edge views with anal opening, × 1; 6–8, *Regnellicystis typicalis*, n. gen. and sp., basal and side views, × 2, and part of latter enlarged; 9, 10, *Sinclairocystis praedicta*, n. gen. and sp., side view, × 2, with anal pore to right and top view with two arms on left, × 2; 11, 12, *Foerstecystis obliqua*, n. gen. and sp., two cotypes, × 2, one showing the anal opening and the other the opposite side; 13, 14, *Schuchertocystis radiata*, n. gen. and sp., anal and top views, × 2; 15, 16, *Kirkocystis papillata* (Bassler, 1943) (Enoploura?), convex and opposite side of two cotypes, × 4; 17, *Billingsocystis invaginata*, n. gen. and sp., side view of one of the cotypes, × 2; 18, *Ulrichocystis eximia*, n. gen. and sp., anal opening and traces of arm, × 2; 19, *Strimplecystis oklahomensis*, n. gen. and sp., the fragmentary type, × 2, showing plates with diplopores and remains of arms.

tically elongate pores. Named in remembrance of Dr. Charles Schuchert.

Genotype, *S. radiata*, n. sp.

Schuchertocystis radiata, n. sp. Figs. 13, 14

Theca 13 mm high, 7.5 to 9.5 mm wide, ovate in lateral outline, flattened in a direction oblique to the axis passing through the anal area. From the widest part, about 4 mm below the top a short distance below the anal area, the theca narrows downward to a width of 8 mm at a point 5 mm above its base, which is about 1.5 mm in width where it was probably attached to a column of still smaller dimensions. The latter is located strongly excentrically on the antanal side of the theca. The lower part of the thecal outline along its anal side is strongly protuberant, while on the antanal side it is relatively straight.

Occurrence.—Blackriveran (Benbolt formation), Washburn, Grainger County, Tenn.

Holotype.—U. S. N. M. no. 53108.

Sinclairocystis, n. gen.

Like *Comarocystites*, but instead of having four free arms it has two recumbent ones rising vertically from the theca. Named in honor of Dr. G. Winston Sinclair, who had predicted the occurrence of this type of cystoid just preceding its discovery.

Genotype, *S. praedicta*, n. sp.

Sinclairocystis praedicta, n. sp. Figs. 9, 10

Represented by four specimens, of which the holotype, 20 by 20 mm high and wide and 15 mm thick, best exhibits the characteristic *Comarocystites* plate structure and shows the two recumbent arms of stout plates extending about two-thirds of the way to the base.

Occurrence.—Blackriveran (Bromide formation, near top of green shale), 1.8 miles south of Sulphur, Okla.

Holotype.—U. S. N. M. no. 116332.

Class CYSTOIDEA Von Buch, 1846

Order RHOMBIFERA Zittel, 1879

ULRICHOCYSTIDAE, n. fam.

Characters same as in the genus.

Ulrichocystis, n. gen.

Theca fusiform, with an elliptical opening at its oral end surrounded by six thecal plates but with only a trace of a recumbent arm with facets for the support of brachioles. The genotype resembles *Palaeocystites dawsoni* in the arrangement of a large part of the thecal plates in vertical rows, but it differs in having only three plates in the basal series. Dedicated to Dr. E. O. Ulrich.

Genotype, *U. eximia*, n. sp.

Ulrichocystis eximia, n. sp. Fig.18

Theca fusiform or clavate in outline; height 34 mm, greatest width 15.5 mm, least width 13 mm in the same plane. The greatest width is located 10 mm below the top of the theca, from which point to the base the rate of tapering is very even. Diameter of base slightly over 3 mm. The elliptical opening at the oral end is 2.5 mm long and 1.4 mm wide, slightly broken along one edge where its width is 2.0 mm. The six surrounding plates rise gently at the margin, leaving it sharp-lipped. The anal area is 2.9 to 3.4 mm in diameter in different directions, with its center about 5 mm below the top of the theca, which consists of approximately 75 plates chiefly hexagonal in outline. The basal series is composed of three elongated plates, surmounted by a second series consisting of five plates, of which the one of the antanal side is conspicuously longer. Surmounting the five plates in the second series are five vertical rows, each including six plates, not counting the circumoral plates or those belonging to the second series.

Occurrence.—A single specimen from Luttrell, Tenn., in the Benbolt formation.

Holotype.—U. S. N. M. no. 93398.

Order DIPLOPORITA J. Müller, 1854

REGNELLICYSTIDAE, n. fam.

Regnellicystis, n. gen.

This interesting diplopore is characterized by its broadly oval theca, 15 mm high and 14 mm wide, arising from four sharply marked basals and composed of many uncommonly small plates, all radially arranged and divided by sharp ridges into several compartments each pierced by a single large diplopore. In addition, the type specimen bears an anal pyramid about 2 mm wide located 3 to 5 mm below the thecal top. The latter bears five simple food grooves extending to the lower level of the pyramid and lined with thin flat brachioles. Named in honor of Dr. Gerhard Regnéll.

Genotype, *R. typicalis*, n. sp.

Regnellicystis typicalis, n. sp. Figs. 6–8

Description as above.

Occurrence.—Blackriveran (Benbolt formation), Rye Cove, Scott County, Va.

Holotype.—U. S. N. M. no. 113308.

Strimplecystis, n. gen.

Characters as in the specific description. Named in honor of Melba and Harrell Strimple.

Genotype, *S. oklahomensis*, n. sp.

Strimplecystis oklahomensis, n. sp. Fig. 19

Type and only specimen, a fragment of a calyx of many rather large radially arranged plates each pierced by a dozen or more diplopores much as in *Eumorphocystis* Branson and Pack, 1940, but differing in still preserving two short, unbranched food grooves out of probably five, each lined with a series of thin flat plates serving as brachioles. The rest of the specimen is such a jumble of plates that additional examples are necessary for more information. The tentative position assigned above seems the best under the circumstances.

Occurrence.—Blackriveran (Bromide formation, 140 feet below top), Oklahoma State Highway 99, Sec. 22, T. 1 N., R. 6 E., Oklahoma.

Holotype.—U. S. N. M. no. 115193.

Class CARPOIDEA Jaeckel 1900

Family ANOMALOCYSTITIDAE Bassler, 1943

Kirkocystis, n. gen. Figs. 15, 16

This new generic name, proposed in honor of Dr. Edwin Kirk, is based upon a carpoid related to *Enoploura* but differing in that the theca is composed of only two large elongate plates on the convex side and three equally long plates on the concave side. Typical *Enoploura* develops three plates in both the marginal and middle series of both sides. The surface ornamentation of small distinct papillae separated by very minutely reticulated spaces is another feature of *Kirkocystis.*

Genotype, *Enoploura? papillata* Bassler, 1943 (Amer. Journ. Sci. **241**: 695, pl. 1, figs. 3–5. 1943).

Occurrence.—Blackriveran (40′ below top Bromide formation), Rock Crossing, Criner Hills, Sec. 35, T. 5S., R. 1 E., Oklahoma.

Cotypes.—U. S. N. M. no. 113105.

PALEONTOLOGY.—*New stropheodontid brachiopods.*[1] ALWYN WILLIAMS, Glasgow University. (Communicated by G. A. Cooper.)

The following descriptions are part of a recently completed morphological and systematic study of stropheodontid Brachiopoda of North America and Europe. The proposed systematic revision will be used in a forthcoming publication on British Silurian brachiopods and is here given in outline because the results as a whole will not be in print for some time.

Most of the types are located at the U. S. National Museum, and I take this opportunity to express my deep appreciation to the authorities of the Smithsonian Institution for making all their collections available to me, and my grateful thanks to Dr. G. Arthur Cooper, curator of invertebrate paleontology and paleobotany, for helpful criticism and advice during my investigations.

Family STROPHEODONTIDAE Caster

Hercostrophia, n. gen. Figs. 1–6

Exterior.—Transversely semioval, gently concavo-convex to almost biplanate. Pseudodeltidium entire with a narrow median fold, chilidium vestigial. Ornamented by finely parvicostellate ribbing with accentuated primaries.

Ventral interior.—Hinge-line denticulate for about three-quarters its length. Diductor scars elongate, divergent, each contained by an outer and inner lateral, obtusely triangular ridge, the apices of which meet posterolaterally to form a narrow ring of shell deposit around each scar. Adductor scars fine, lanceolate, impressed posteriorly on either side of a low median ridge.

Dorsal interior.—Cardinal process lobes disjunct, socket plates vestigial. Adductor scars faintly impressed posteriorly to two pairs of ridges, an inner tuberculate pair, and an outer, low, somewhat indistinct pair.

Genotype.—Hercostrophia alpenensis, n. sp.

Range.—Middle Devonian.

Discussion.—The new genus includes an American group of shells presumably divergent from the shalerid stock. These forms differ from their shalerid contemporaries in the encirclement of the diductor muscle scars by the inward growth of the apices of the bounding ridges, the strong curvature to the outer bounding ridges, and the corresponding splayed flabellate appearance of

[1] Received May 17, 1950.

the diductor scars, and in the discrete nature of the inner pair of ridges in the dorsal valve.

Hercostrophia alpenensis, n. sp. Figs. 2, 4

Dimensions (in centimeters).—

	Length	*Width*
Holotype: U.S.N.M. No. 116017	1.0	1.4
Paratype: U.S.N.M. No. 116018	0.9	1.2
Paratype: U.S.N.M. No. 116019a	1.1	1.7

Sample population (length, width, in centimeters).—0.6, 0.8; 0.6, 0.8; 0.9, 1.2; 0.9, 1.2; 0.9, 1.2; 1.0, 1.3; 1.0, 1.3; 1.0, 1.4; 1.0, 1.4; 1.0, 1.4; 1.1, 1.4; 1.1, 1.4; 1.1, 1.4; 1.2, 1.5; 1.1, 1.6; 1.1, 1.6; 1.2, 1.6; 1.2, 1.6; 1.2, 1.6; 1.2, 1.7; 1.3, 1.8; 1.4, 1.9.

Exterior.—Moderate size, transversely semioval, gently concavo-convex. Ventral interarea apsacline, pseudodeltidium entire, with a narrow median fold; dorsal interarea anacline, chilidium vestigial. Ornamented by a finely parvicostellate ribbing with strong primaries, and by strong concentric lines of growth

Ventral interior.—Hinge-line denticulate for about three-quarter length. Process pits excavate, ventral process strong. Adductor scars finely impressed, diductor scars elongated, divergent, outer and inner lateral ridges meeting postero-centrally to form a pair of narrow rings; outer ridges, anterior to the rings, only slightly curved.

Dorsal interior.—Cardinal process lobes disjunct, attachment faces directed posteriorly. Socket plates vestigial strengthened by transverse band of secondary shell material. Medial ridge long and low. Adductor scars posterior to two pairs of lateral ridges, inner pair high, tuberculate, outer pair rather indistinct.

Type material.—Holotype, U. S. N. M. no. 116017; figured paratypes, U. S. N. M. nos. 116018, 116019a; unfigured paratypes, U. S. N. M. no. 116019.

Horizon and locality.—Alpena limestone, 30′–40′ below top at Michigan Alkali Company Quarry, Alpena, Mich.

Hercostrophia robusta, n. sp. Figs. 1, 5

Dimensions (in centimeters).—

	Length	*Width*
Holotype: U.S.N.M. No. 116020	1.8	2.6
Paratype: U.S.N.M. No. 116021	1.5	2.4

Sample population (length, width, in centimeters).—1.2, 1.6; 1.2, 1.7; 1.3, 1.7; 1.6, 1.9; 1.5, 2.0; 1.6, 2.0; 1.6, 2.0; 1.5, 2.1; 1.5, 2.2; 1.6, 2.2; 1.6, 2.3; 1.8, 2.3; 1.8, 2.4; 1.9, 2.6.

Exterior.—Large, transversely semioval, very gently concavo-convex with a planate appearance. Ventral interarea apsacline, pseudodeltidium entire with a narrow median fold; dorsal interarea anacline, chilidium vestigial. Ornamented by a finely parvicostellate ribbing with strong primaries, and by concentric lines of growth.

Ventral interior.—Denticulate for about three-quarter length of hinge-line. Process pits excavate; ventral process strong. Adductor scars lanceolate, foliaceous. Diductor scars, divergent, splayed anteriorly, inner and outer lateral ridges to each scar strong, and forming a thin ring posterocentrally. Outer lateral ridges strongly curved anterior to the rings. Peripheral callus well developed.

Dorsal interior.—Unknown.

Type material.—Holotype, U. S. N. M. no. 116020; figured paratype, U. S. N. M. no. 116021; unfigured paratypes, U. S. N. M. no. 116022.

Horizon and locality.—3-foot shale on "Blue" bed; quarry at Silica, 2½ miles southwest of Sylvania, Ohio.

Discussion.—This species differs from *P. alpenensis* in (1) the consistently larger and stronger shells attained in maturity; (2) the almost planate disposition of the valves toward the periphery; (3) the pronounced curves to the outer lateral ridges bounding the diductor scars and the splayed nature of the scars themselves, and (4) the presence of a strong, low callus around the periphery.

Hercostrophia sp. Figs. 3, 6

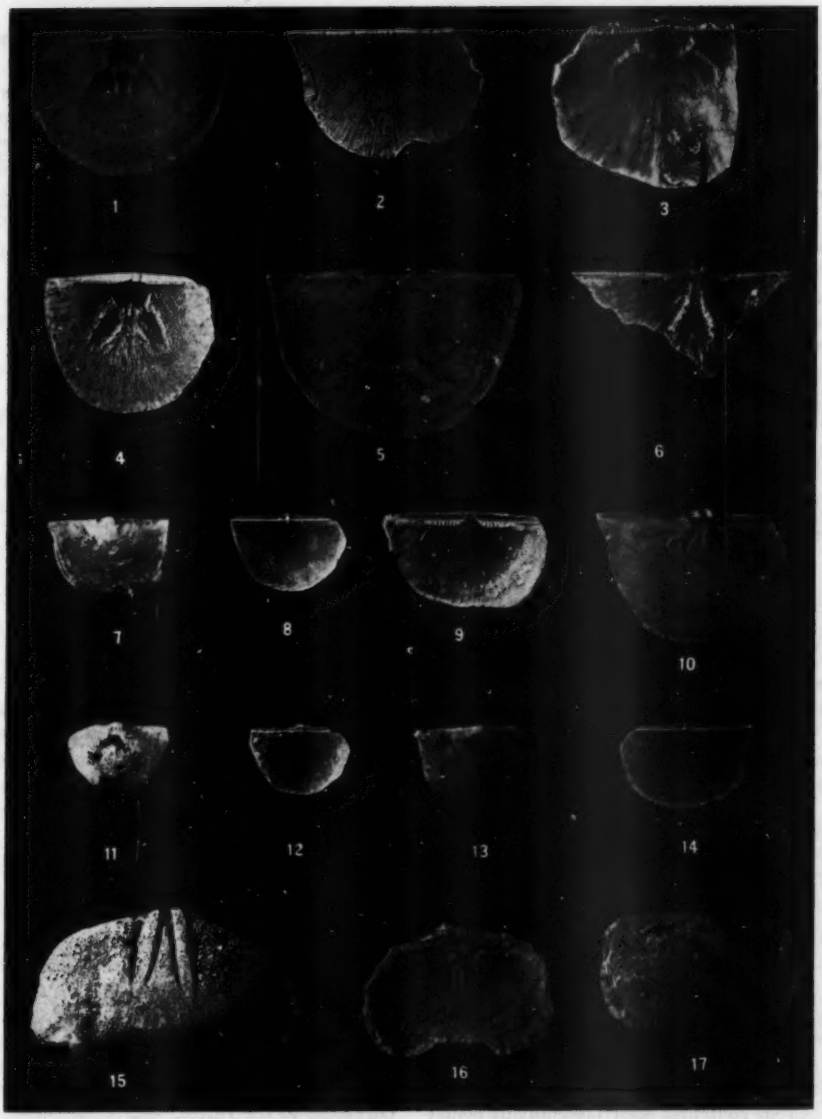
Specimens of an undescribed species often confused with *Douillina* are figured for comparison with the Michigan and Ohio species. A fragmentary brachial valve shows details of the cardinalia.

Figured specimens.—U. S. N. M. no. 116034 a, b.

Horizon and locality.—Hamilton group, Canandaigua Lake, N. Y.

Pholidostrophia (Mesopholidostrophia), n. subg. Figs. 7–10

Silurian pholidostrophids possessing an incompletely developed pseudodeltidium, a prominent



FIGS. 1, 5.—*Hercostrophia robusta*, n. sp.: 1, Ventral interior of paratype (U.S.N.M. no. 116021), × 2; 5, dorsal view of complete shell of holotype (U.S.N.M. no. 116020), × 1¼.

FIGS. 2, 4.—*Hercostrophia alpenensis*, n. sp.: 2, Dorsal view of almost complete shell of paratype (U.S.N.M. no. 116018), × 2; 4, ventral interior of holotype (U.S.N.M. no. 116017), × 2.

FIGS. 3, 6.—*Hercostrophia* sp.: 3, Ventral interior of U.S.N.M. no. 116034a, × 2; 6, dorsal interior of U.S.N.M. no. 116034b, × 2.

FIGS. 7–10.—*Pholidostrophia* (*Mesopholidostrophia*) *nitens*, n. subg. and sp.: 7, Ventral exterior of holotype (U.S.N.M. no. 116023), × 2; 8, dorsal view of entire specimen, a paratype (U.S.N.M. no. 116024a), × 2; 9, ventral interior of paratype (U.S.N.M. no. 116024b), × 3; 10, dorsal interior of paratype (U.S.N.M. no. 116024c), × 3.

FIGS. 11, 12.—*Lissotrophia* (*Mesolissostrophia*) *minuta*, n. subg. and sp.: Ventral and dorsal views of an entire shell, holotype (U.S.N.M. no. 116028), × 2.

FIGS. 13, 14.—*Lissostrophia* (*Mesolissostrophia*) *pellicida*, n. subg. and sp.: Ventral and dorsal views of an entire shell, holotype (U.S.N.M. no. 116026), × 2.

FIGS. 15–17.—*Shaleria* (*Telaeoshaleria*) *sulcata*, n. subg. and sp.: 15, Mold of ventral interior of paratype (U.S.N.M. no. 116031), × 2; 16, mold of dorsal interior of paratype (U.S.N.M. no. 116023), × 1½; 17, ventral interior of holotype (U.S.N.M. no. 116030), × 2.

to vestigial chilidium, a conjunct to incipiently disjunct cardinal process, and progressively degenerate socket plates. Muscle scars pholidostrophid but not impressed.

Genotype.—*Pholidostrophia* (*Mesopholidostrophia*) *nitens*, n. sp.

Discussion.—Differs from *Pholidostrophia* (*Pholidostrophia*) Hall and Clarke (1892, p. 287), which is here emended to include only forms with a smooth pseudodeltidium, no chilidium, a disjunct cardinal process, no socket plates, and strongly impressed muscle scars.

Pholidostrophia (Mesopholidostrophia) nitens, n. sp. Figs. 7–10

Dimensions (in centimeters).—

		Length	*Width*
Holotype:	U.S.N.M. No. 116023.....	0.65	0.96
Paratypes:	U.S.N.M. No. 116024a.....	0.6	0.9
	U.S.N.M. No. 116024b.....	0.7	1.2
	U.S.N.M. No. 116024c.....	0.65	1.0

Exterior.—Outline transversely semioval, mucronate, concavo-convex with a slight to moderate, even curvature to the valves. Ventral interarea apsacline, pseudodeltidium very small, dorsal interarea anacline, chilidium massive. Surface pseudonacreous, lamellose, free of radial ornamentation except for traces of fine primary costellae buried under the lamellose layer. Lamellose material heavily deposited toward the periphery to break the contour of the shells with concentric overlapping edges.

Ventral interior.—Hinge-line denticulate for less than half the length. Process pits very lightly impressed. Ventral process faintly developed. Adductor scar lanceolate impressed posteriorly and divided medianly by a very fine septum, diductor scars subcircular feebly impressed.

Dorsal interior.—Cardinal process lobes slender, socket plates small. Notothyrial platform virtually absent, adductor scars lightly impressed subquadrate contained posterolaterally by bounding ridges and divided by a feeble median ridge.

Type material.—Holotype, U. S. N. M. no. 116023; figured paratypes, U. S. N. M. nos. 116024a–c; unfigured paratypes, U. S. N. M. no. 116025.

Horizon and locality.—"Gotlandian," brickyard near Klintehamn, Gotland.

Discussion.—The large amount of excellent material available at the U. S. National Museum indicates that this stock is fairly common in the Middle Silurian "shales" of Gotland, but so far as I am aware it has not been described. For purposes of close comparison between this species and any other undescribed material that exists, the following measurements of a U. S. N. M. sample are given (length of the shell followed by width of the shell at the hinge-line, in centimeters): 0.79, 1.25; 0.69, 1.00; 0.60, 0.94; 0.69, 1.00; 0.45, 0.69; 0.63, 0.97; 0.47, 0.63; 0.75, 1.10; 0.79, 1.10; 0.46, 0.79; 0.63, 0.94; 0.59, 0.72; 0.60, 0.87; 0.46, 0.69; 0.63, 1.00; 0.50, 0.90; 0.45, 0.79; 0.58, 0.91; 0.60, 0.91; 0.49, 0.85; 0.79, 1.06; 0.60, 1.10; 0.60, 1.00; 0.25, 0.35; 0.17, 0.25.

Lissostrophia (Mesolissostrophia), n. subg. Figs. 11–14

Erected to include Lower Silurian lissostrophids with an incompletely developed pseudodeltidium, a strong to vestigial chilidium, conjunct to incipiently disjunct cardinal process, abbreviated to obsolescent socket plates, and faintly impressed lissostrophid muscle scars.

Genotype.—*Lissostrophia* (*Mesolissostrophia*) *pellucida*, n. sp.

Discussion.—Differs from *Lissostrophia* (*Lissostrophia*) Amsden, 1949 (p. 202), which is here emended, in that the latter subgenus embraces forms with a smooth pseudodeltidium, no chilidium, a disjunct cardinal process, no socket plates, and strongly impressed muscle scars.

Lissostrophia (Mesolissostrophia) pellucida, n. sp. Figs. 13, 14

Dimensions (in centimeters).—

		Length	*Width*
Holotype:	U.S.N.M. No. 116026.....	0.7	1.1
Paratypes:	U.S.N.M. No. 116027a.....	0.7	1.1
	U.S.N.M. No. 116027b.....	0.64	0.94

Exterior.—Rather small, transversely oval in outline, mucronate, concavo-convex with a low curvature to the valves. Ventral interarea apsacline, pseudodeltidium incipient, dorsal interarea anacline, chilidium large. Shell smooth, pellucid, ornamented only by fine concentric lines of growth.

Ventral interior.—Denticulate for a short distance on each side of the delthyrium. Process pits faintly excavate, ventral process incipiently developed, muscle scar obscure.

Dorsal interior.—Cardinal process lobes elongated conjunct, socket plates abbreviated, adductor scars obscure, median ridge low.

Type material.—Holotype, U. S. N. M. no. 116026; paratypes, U. S. N. M. nos. 116027a, b.

Horizon and locality.—"Gotlandian," brickyard near Klintehamn, Gotland.

Lissostrophia (Mesolissostrophia) minuta, n. sp. Figs. 11, 12

Dimensions (in centimeters).—

		Length	*Width*
Holotype:	U.S.N.M. No. 116028	0.4	0.6
Paratypes:	U.S.N.M. No. 35649a	0.42	0.52
	U.S.N.M. No. 116029a	0.38	0.4

Exterior.—Very small, elongately oval in outline, mucronate, concavo-convex with a high degree of curvature. Shell smooth, pellucid, ornamented by a few concentric growth lines. Ventral interarea apsacline, pseudodeltidium incipient, dorsal interarea anacline, chilidium large, convex.

Interiors unknown.

Type material.—Holotype, U. S. N. M. no. 116028; paratypes, U.S.N.M. nos. 35649, 116029a.

Horizon and locality.—Waldron shale, Newsom, Tenn.

Shaleria (Telaeoshaleria), n. subg. Figs. 15–17

Devonian shalerids with an entire pseudodeltidium folded medianly, vestigial chilidium, divergent ventral muscle scars with the median septum bifurcated posteriorly dorsal muscle scar platform elevated with the anterior parts of the outer ridges indistinct and the inner plates fused posteriorly.

Genotype.—Shaleria (Telaeoshaleria) sulcata, n. sp.

Discussion.—The Silurian and early Devonian shalerids included in *Shaleria* (*Shaleria*) Caster, 1939 (p. 33), emended differ from these end stock members in having an incompletely developed pseudodeltidium, a strong to weak chilidium, ventral muscle scars lying parallel to each other with the median septum bifurcated posteriorly, and a weakly developed dorsal muscle scar platform with the four anterior ridges strong and discrete.

Shaleria (Telaeoshaleria) sulcata, n. sp. Figs. 15–17

Dimensions (in centimeters).—

		Length	*Width*
Holotype:	U.S.N.M. No. 116030	1.1	1.6 (est.)
Paratypes:	U.S.N.M. No. 116033a	1.3	2.0
	U.S.N.M. No. 116032	1.2	1.8

Exterior.—Moderate size, subquadrate, moderately concavo-convex, slightly geniculate, dorsal and ventral valves with a complementary fold and sulcus anteromedianly. Ventral interarea apsacline, pseudodeltidium entire but with narrow fold; dorsal interarea anacline, chilidium obsolete. Ribbing finely parvicostellate with strong rather widely spaced primaries.

Ventral interior.—Hinge-line denticulate for the entire length of the body chamber. Diductor scars narrow, long, divergent, bounded laterally by high septa the inner pair of which resulted from the posterior bifurcation of the median septum. Adductor scars narrow, small, impressed posteriorly on either side of the median septum.

Dorsal interior.—Cardinal process lobes disjunct socket plates vestigial. Adductor scars subcircular deeply impressed and contained by coalescence of four ridges, the inner pair of which extend anteriorly beyond the platform, parallel to each other and separated by a small thin median ridge.

Type material.—Holotype, U. S. N. M. no. 116030; figured paratypes, U.S.N.M. nos. 116031, 116032; unfigured paratypes, U. S. N. M. nos. 116033.

Range.—Middle Devonian (Calceola beds).

Type locality.—Lissingen, Eifel, Germany.

Douvillina (Mesodouvillina), n. subg.

Erected to include Silurian douvillinids with an incompletely developed pseudodeltidium, prominent to vestigial chilidium, conjunct to incipiently disjunct cardinal process, short socket plates, no anterior bounding ridges to the ventral muscle scar, and poorly defined braceplates occurring as a pair of low ridges anterior to the dorsal muscle scar.

Genotype.—Brachprion subinterstrialis serentensis Kozlowski (1929, pp. 96–99, figs. 28–29; pl. 4, figs. 1–7).

Discussion.—Douvillina (*Douvillina*) Oehlert, 1887 (p. 1282), is here restricted to those Devonian forms in which the pseudodeltidium is entire but folded medianly, the chilidium and socket plates obsolete, the cardinal process disjunct, the ventral muscle scars progressively contained by strong lateral and anterior bounding ridges, and well developed braceplates. These are the essential differences between the two subgenera.

Strophonella (Eostrophonella), n. subg.

Erected to include lower Silurian strophonellids with dental plates supporting the denticulate

zone of the hinge-line, an incipiently developed pseudodeltidium, platelike cardinal process lobes, long divergent socket plates, and a subcircular ventral muscle scar.

Genotype.—*Strophonella davidsoni* Holtedahl, 1916 (pp. 64–65, pl. 7, figs. 6, 7).

Discussion.—*Strophonella* (*Strophonella*) Hall, 1879 (p. 152), is here restricted to include forms characterized by having no dental plates, a progressively developed pseudodeltidium stout cardinal process lobes, short to obsolescent socket plates and a petaloid ventral muscle scar. These are the essential differences between the two subgenera.

Glossostrophia, n. gen.

Exterior.—Transversely semioval; geniculately resupinate but with a narrow median zone of the geniculate portion projecting dorsally like a tongue. Pseudodeltidium entire with a narrow median fold, chilidium vestigial. Ornamented by fine parvicostellae with strong primaries.

Ventral interior.—Hinge-line denticulate for about three-quarters its length. Muscle scar subtriangular in outline, lateral bounding ridges strongly developed posterolaterally.

Dorsal interior.—Cardinal process lobes disjunct, socket plates robust, lying adjacent to the cardinal process lobes. Adductor scars suboval, contained laterally by a pair of high short ridges and anteriorly by a pair of low subcircular, elevated areas.

Genotype.—*Leptaena caudata* Schnur (1854, p. 224, pl. 42, fig. 4a–c).

Range.—Middle Devonian.

Discussion.—This genus is erected for a group of resupinate forms, closely related to the leptostrophid-nervostrophid stock unique among all stropheodontids in possessing the dorsally projecting tonguelike process. One other resupinate group of this stock is known, namely, *Gamphalosia* Stainbrook (1945, p. 33). In addition to the difference cited above, *Gamphalosia* is ornamented in a nervate fashion as opposed to the parvicostellate type of *Glossostrophia*. No internal comparisons are possible because the interiors of *Gamphalosia* are unknown.

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BOTANY.—*Three new Carices from Mexico and Guatemala.* FREDERICK J. HERMANN.[1] U. S. Department of Agriculture.

Among an extensive collection of sedges made by Dr. A. J. Sharp in Mexico and Guatemala and an earlier collection made by Dr. C. H. Muller in Chihuahua the following undescribed species were found:

Carex percostata, sp. nov. (Multiflorae). Rhizomata crassa, lignea, memnonia, fibrillosa; culmi 3–6 dm alti, obtuse triangulares, infra capitulum scaberuli alibi laeves, foliis multo longiores; folia 3–6, ad basim culmi aggregata, vaginis ventraliter paulum ore productis, ligula brevi, laminis planis, rigidis, 1–3 dm longis, 3–4 mm latis, marginibus ad apicem attenuatum scabriusculis; capitulum late oblongum vel ovoideo-oblongum, 2–2.5 cm longum, 1–1.5 cm latum; spicae 7–12 androgynae, aggregatae vel infimae plus minusve disjunctae, ovoideae, perigyniis 5–8 adscendentibus patentibusve parte mascula conspicua; bracteae squamiformes vel infima setaceo-producta; squamae ovatae, acutae vel brevicuspidatae, perigyniis breviores; perigynia inaequaliter biconvexa, oblongo-ovoidea, 4–5 mm longa, 2.25–2.5 mm lata, fulvo-straminea apice brunnea,

[1] Received June 9, 1950.

coriacea, nitentia, utrinque 10–15-costata sulcataque marginibus paulum acutis in rostrum breve serrulatum abrupte attenuatum, ad basim stipitatam valde spongiosam contracta; achaenia lenticularia obovata, olivacea, 2.5 mm longa, 2.2 mm lata.

Rootstocks stout, woody, short-creeping, blackish, fibrillose; culms 3–6 dm high, erect, about twice the length of the leaves, bluntly triangular and coarsely ribbed, smooth except below the head where scaberulous, phyllopodic; leaves 3–6 to a fertile culm, clustered near the base, the sheaths hyaline ventrally, scarcely prolonged at the mouth, the ligule short, usually broader than long, the blades flat, stiff, dull green, 1–3 dm long, 3–4 mm wide, the margins roughened toward the long-attenuate apex; head broadly oblong to ovoid-oblong, 2–2.5 cm long, 1–1.5 cm wide, the spikes 7–12, androgynous, aggregated or the lower more or less separate, ovoid, with 5–8 ascending or at length spreading perigynia, the staminate portion prominent; bracts squamiform, the lower one or two generally abruptly setaceous-prolonged; scales ovate, acute or short-cuspidate, narrower than and about the length of the bodies of the perignyia, dirty brown with very narrow hyaline margins and stramineous 1–3-nerved center; perigynia unequally biconvex, oblong-ovoid, 4–5 mm long, 2.25–2.5 mm wide, lustrous, tawny-stramineous the upper half becoming brown, coriaceous, heavily 10–15-ribbed and furrowed on both faces, scarcely sharp-edged, serrulate on the upper third, abruptly tapering into a serrulate, bidentulate, dorsally cleft beak one-fourth the length of the body; the base very spongy and rounded or abruptly tapering to a short stipe; achenes lenticular, obovate, olive-brown, 2.5 mm long, 2.2 mm wide, apiculate; style slender, straight; stigmas 2, slender, straight.

MEXICO: Scattered on wet meadows in open pine forest, 20 miles north of Madera, Municipio de Madera, Chihuahua, September 27, 1939, *C. H. Muller 3520* (type, U. S. National Arboretum Herbarium); dried pool in bottom of sink west of Chilpancingo, alt. 6,000 feet, Guerrero, October 20, 1944, *A. J. Sharp 44137*5 (U. S. National Arboretum Herbarium; University of Tennessee Herbarium).

Nearest allied to *Carex marienensis* Stacey (*C. autumnalis* Mack., not Ohwi), a montane species known from the states of México, Oaxaca, Hidalgo, and Chihuahua, and like it maturing unusually late in the season. From this it differs strikingly in its perigynia which are unequally biconvex rather than planoconvex, larger (4–5 by 2.25–2.5 mm, rather than 3.5–4 by 1.5–2 mm), more abruptly and shorter-beaked (the beak one-fourth rather than one-half the length of the body), scarcely sharp-margined, lustrous and heavily ribbed and sulcate on both faces. The achenes, too, are larger (2.5 by 2.2 mm instead of 2 by 1.5 mm) and darker, the spikes fewer-flowered and with a much more conspicuous staminate portion, the heads shorter and broader and the sheaths not obviously prolonged at the mouth.

Carex atractodes, sp. nov. (Granulares). Caespitosa e rhizomatibus modice validis; culmi 1.5–4 dm alti, obtuse triangulares, folia paulum superantes; folia 2–4, laminis 5–25 cm longis, 2–6 mm latis, planis, ad apicem minute scabriusculis; spica terminalis mascula, 6–12 mm longa, 1.2–2 mm lata, brevipedunculata vel subsessilis, squamis oblongis, plus minusve carinatis; spicae femineae 3 vel 4, erectae, lineari-oblongae, 5–14 mm longae, 3–5 mm latae, compacte 10–25-florae, infima pedunculo capillari, bracteis frondosis inflorescentiam superantibus, lamina infima 4–12 cm longa, vaginis longis (usque ad 24 mm); squamis elliptico-lanceolatis, 2 mm longis, hyalinis costa viridi-carinata, perigyniis dimidio brevioribus; perigynia fusiformia, 3–3.3 mm longa, 1.5 mm lata, conspicue multinervia, coriacea, atroviridia, in rostrum breve integrum contracta; achaenia triangularia, obovoidea, 1.8 mm longa, 1.1 mm lata, stipitata, stylo recto.

More or less cespitose from moderately stout, dark brown, creeping rootstocks; culms 1.5–4 dm high, phyllopodic, slender, flexuous, little exceeding the leaves, bluntly triangular, smooth or minutely scabridulous between the veins; leaves 2–4 to a fertile culm, mostly on the lower third of the culm, the blades flat, erect, 5–25 cm long, 2–6 mm wide, linear, scaberulous toward the apex, the sheaths loose, hyaline and early ruptured ventrally, the ligule prolonged, acuminate, many times longer than wide; staminate spike linear, erect, subsessile and often concealed between the two uppermost pistillate spikes or short-peduncled (peduncle up to 3 mm long), 6–12 mm long, 1.2–2 mm wide, the scales oblong, bluntly acute to minutely cuspidate, 3.5 mm long, appressed-ascending, pale reddish brown with a broad light green, more or less carinate midrib, usually scabridulous toward the apex; pistillate spikes 3 or 4, erect, the lowermost widely separate on a long-exserted, capillary peduncle, the

upper short-peduncled or sessile, linear-oblong, 5–14 mm long, 3–5 mm wide, closely 10–25-flowered, the perigynia ascending; bracts large and leaflike, generally exceeding the inflorescence, the blade of the lowermost 4–12 cm long, the sheaths long (to 24 mm) somewhat prolonged at the mouth and the ligule conspicuous; scales elliptic-lanceolate, acuminate, 2 mm long and about half the length of the perigynia, thin, hyaline and tinged with reddish brown except for the stout, green, carinate midrib; perigynia fusiform, 3–3.3 mm long, 1.5 mm wide, sessile, prominently many-nerved, coriaceous, closely investing the achene, dark green, shading to chestnut-brown at the base, resinous-puncticulate, tapering into a short, straight, entire beak; achenes trigonous, broadly obovoid, 1.8 mm long, 1.1 mm wide, brown, granular, tapering to the short-stipitate base, abruptly rounded at the apex, conspicuously straight-apiculate, jointed with the short, slender style; stigmas 3, slender, reddish brown.

MEXICO: Edge of ditch near Lake Jusnajav, alt. 5,500 feet, about 16 km northwest of Comitan, Chiapas, April 29, 1945, *A. J. Sharp 45450* (type, U. S. National Arboretum Herbarium, duplicate in University of Tennessee Herbarium).

No representatives of the section Granulares have heretofore been reported south of the United States, although *Carex microdonta* Torr. & Hook. is of frequent occurrence in eastern Texas and occasional in the Trans-Pecos area, and *C. rectior* Mack. is known from Alabama and Louisiana. The present species is most closely related to *C. haleana* Olney, which ranges from Quebec and Maine to Saskatchewan, southward to Virginia, Indiana, and Kansas. It is set off from *C. healeana* by its fusiform perigynia (hence the specific epithet), which are longer (3–3.3 mm rather than 2–2.5 mm), notably dark-green, tapering into a more prominent beak and never rounded at the base; by its relatively long pistillate scales (one-half rather than one-fourth the length of the perigynia); and by its stout, creeping rootstocks.

Carex quichensis, sp. nov. (Granulares). Dense caespitosa e rhizomatibus tenuibus; culmi 1.8–4 dm alti, laeves, obtuse triangulares, foliis breviores; folia 3–5, laminis 9–20 cm longis, 3.5–6 mm latis, planis, marginibus ad apicem scabriusculis; spica terminalis mascula, 14–25 mm longa, 1.5–2 mm lata, pedunculo 3–5 mm longo, squamis elliptico-oblongis, mucronatis, costa laevi; spicae laterales femineae vel saepe androgynae 3 vel 4, erectae, lineares 20–30 mm longae, 3.5–5 mm latae, 15–30-florae, infima pedunculo capillari, bracteis frondosis inflorescentiam superantibus, lamina infima 15–20 cm longa, vaginis perlongis (usque ad 45 mm); squamis late elliptico-lanceolatis, 3 mm longis, hyalinis costa viridi saepe plus minusve carinata frequenter mucronatis perigynia subaequantibus; perigynia late ellipsoidea vel anguste obovoidea, 3.2 mm longa, 1.3–1.5 mm lata, conspicue multinervia, subcoriacea, olivacea, basi cuneata, in rostrum breve (0.35 mm) rectum subintegrum ore incrassato abrupte contracta; achaenia triangularia, anguste obovoidea, 2 mm longa, 1 mm lata, stipitata, stylo adunco.

Densely cespitose from slender, pale brown rootstocks; culms 1.8–4 dm high, erect, overtopped by the leaves, smooth, bluntly triangular; sterile shoots conspicuously developed; leaves 3–5 to a fertile culm, the blades flat, linear, erect, 9–20 cm long, 3.5–6 mm wide, scaberulous on the margins toward the apex, the lower sheaths loose, hyaline and soon breaking ventrally, the ligule not conspicuously prolonged, blunt, as long or twice as long as wide, 14–25 mm long, 1.5–2 mm wide, terminal spike staminate, linear, erect, 14–25 mm long, 1.5–2 mm wide, borne on a peduncle 3–5 mm long, the scales elliptic oblong, 4 mm long, appressed, hyaline, tinged with reddish brown, the broad dark green, often somewhat carinate, midrib smooth and extended as a mucro; lateral spikes 3 or 4, erect, pistillate or often androgynous, the lowermost widely separate on a capillary peduncle, the upper short-peduncled, linear, 20–30 mm long, 3.5–5 mm wide at maturity, 15–30-flowered, the perigynia appressed-ascending; bracts leaf-like overtopping the inflorescence, the blade of the lowermost 15–20 cm long, the sheaths, except the uppermost, very long (to 45 mm), prolonged at the mouth and with a prominent ligule; scales broadly elliptic-lanceolate, acuminate, 3 mm long, nearly equaling the perigynia, thin and hyaline, the margins streaked with dark red, the midrib stout, green, generally more or less carinate, extending to or prolonged slightly beyond the tip; perigynia broadly ellipsoid to narrowly obovoid, 3.2 mm long, 1.3–1.5 mm wide, sessile, conspicuously many-nerved, subcoriaceous, little inflated, olive-green, tapering at the base, abruptly contracted above into a short (0.35 mm), stout, straight, subentire beak conspicuously thickened at the

mouth; achenes trigonous, narrowly obovoid, 2 mm long, 1 mm wide, stramineous, granular, tapering to the stipitate base, rounded at the apex, bent-apiculate and jointed with the slender style; stigmas 3, short, dark red.

GUATEMALA: Edge of brook above Nebaj; El Quiché, alt. 7,000 feet, February 7, 1945, *A. J. Sharp 45144* (type, U. S. National Arboretum Herbarium, duplicate in University of Tennessee Herbarium).

In its long, slender pistillate spikes *Carex quichensis* resembles species of the Mexican and southern Californian section Longicaules rather than those of the more northeastern section Granulares, but its apparently erect spikes and its subentire perigynium-beak, which is prominently thickened at the mouth, exclude it from the former group. In section Granulares it falls nearest to the only other known Middle American representative of the section, *Carex atractodes*, described above. From this it is readily separated by its densely cespitose habit, slender rootstocks, and short ligule; by its long terminal (14–25 mm rather than 6–12 mm long) and lateral (20–30 mm rather than 5–14 mm long) spikes, the latter often staminate at the apex, and its long pistillate scales, which nearly equal the perigynia; by its abruptly beaked perigynia; and by its sharply bent style-base.

ENTOMOLOGY.—*Two new genera and three new species of Microlepidoptera from Argentina (Gelechiidae).*[1] J. F. GATES CLARKE, Bureau of Entomology and Plant Quarantine.

The microlepidopterous fauna of Argentina is little known, though several enthusiastic workers, Fernando Bourquin and A. Pastrana of Buenos Aires and Kenneth J. Hayward and associates of Tucumán, are engaged in acquiring useful knowledge of the habits and life histories of these insects. This paper is designed to make known three more species and to provide names so that the biologies of these moths can be published.

Euchionodes, n. gen.

Figs. 1–1*e*; 5–5*b*

Typus generis.—Euchionodes traditionis, n. sp.

Head with spreading, appressed scales. Antenna simple, without pecten from scape. Labial palpus long, recurved, third segment as long as second; brush of second segment with furrow; third segment compressed, roughened posteriorly with a tuft of elongated scales. Tongue well developed.

Forewing elongate, ovate, 12 veins; 1 b furcate; 1 c absent, 2 distant from 3, 3–5 nearly equidistant; 7 and 8 stalked, both to costa; 11 from middle.

Hind wing slightly broader than forewing, 8 veins; 2 distant from 3, 3 from before angle; 6 and 7 divergent, approximate at base; discocellulars outwardly oblique between 2 and 6; crossvein present between cell and 8.

Hind tibia roughened with long hairlike scales.

Male genitalia.—Uncus and gnathos present, the latter a well developed hook.

Female genitalia.—Signum present.

This genus is closely related to *Chionodes* Hübner but differs from it by the scale tuft from the third segment of the palpus, vein 2 of forewing is distant from 3, and 3 of hind wing is well separated from 4. The male and female genitalia of both genera are similar and show definite relationship.

Euchionodes traditionis, n. sp.

Alar expanse, 13–16 mm.

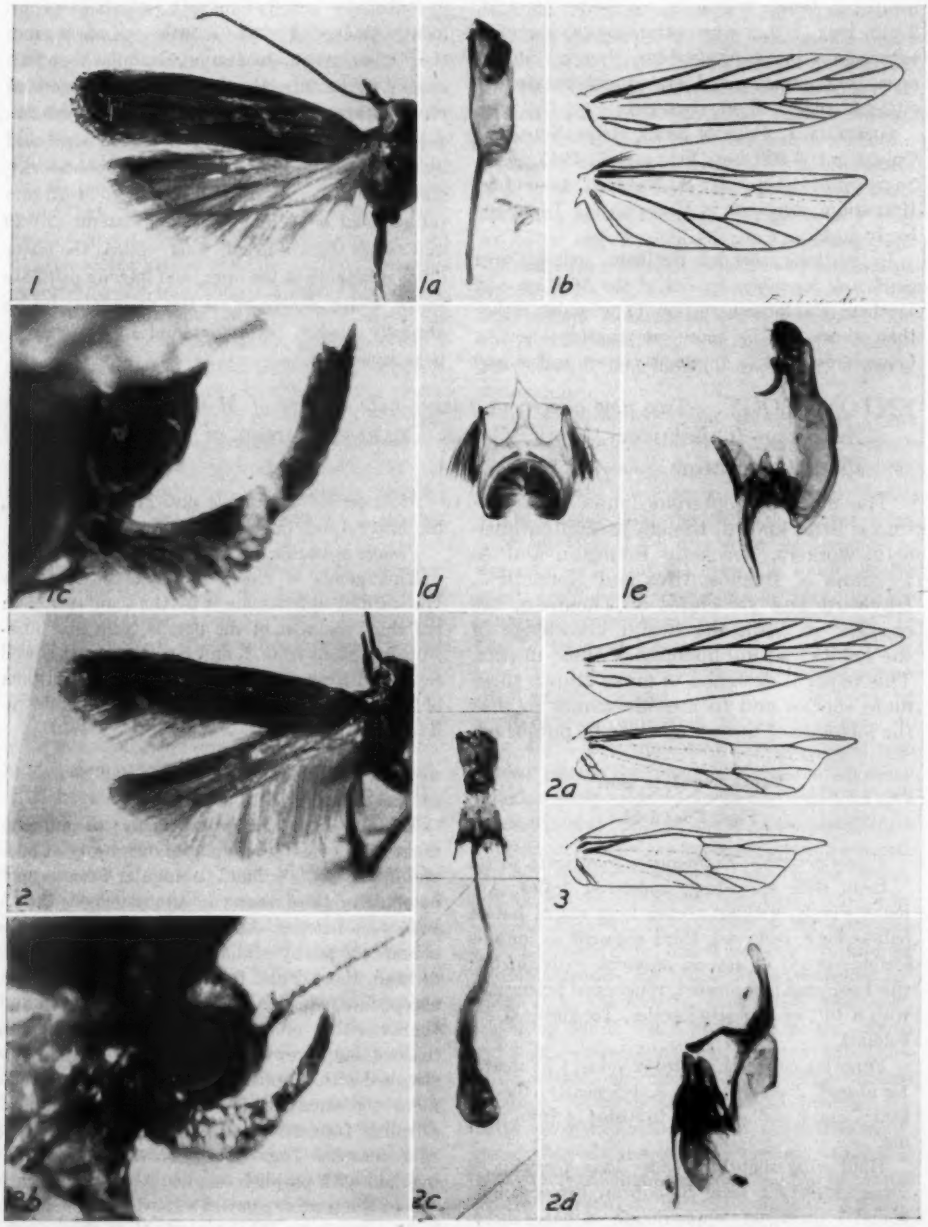
Labial palpus ochraceous-tawny; second segment with a small fuscous spot outwardly at base and a large, subterminal, triangular fuscous spot outwardly; third segment almost wholly overlaid with fuscous. Antenna fuscous with some ochraceous-tawny scaling basally. Ground color of head, thorax, and forewing buckthorn brown, except face, which is ochraceous-tawny; head and thorax with a more or less well defined median fuscous line; forewing more or less longitudinally streaked with purplish fuscous, but in some specimens the streaking is obsolete; apex and cilia purplish fuscous. Hind wing grayish fuscous; cilia fuscous. Legs ochraceous-tawny strongly overlaid with purplish fuscous. Abdomen fuscous except the median-ventral whitish ocherous area.

Male genitalia.—As figured. Note the greatly reduced harpe.

Female genitalia.—As figured. Signum a four lobed plate with two high transverse keels.

Type.—U.S.N.M. no. 59422.

[1] Received May 8, 1950.



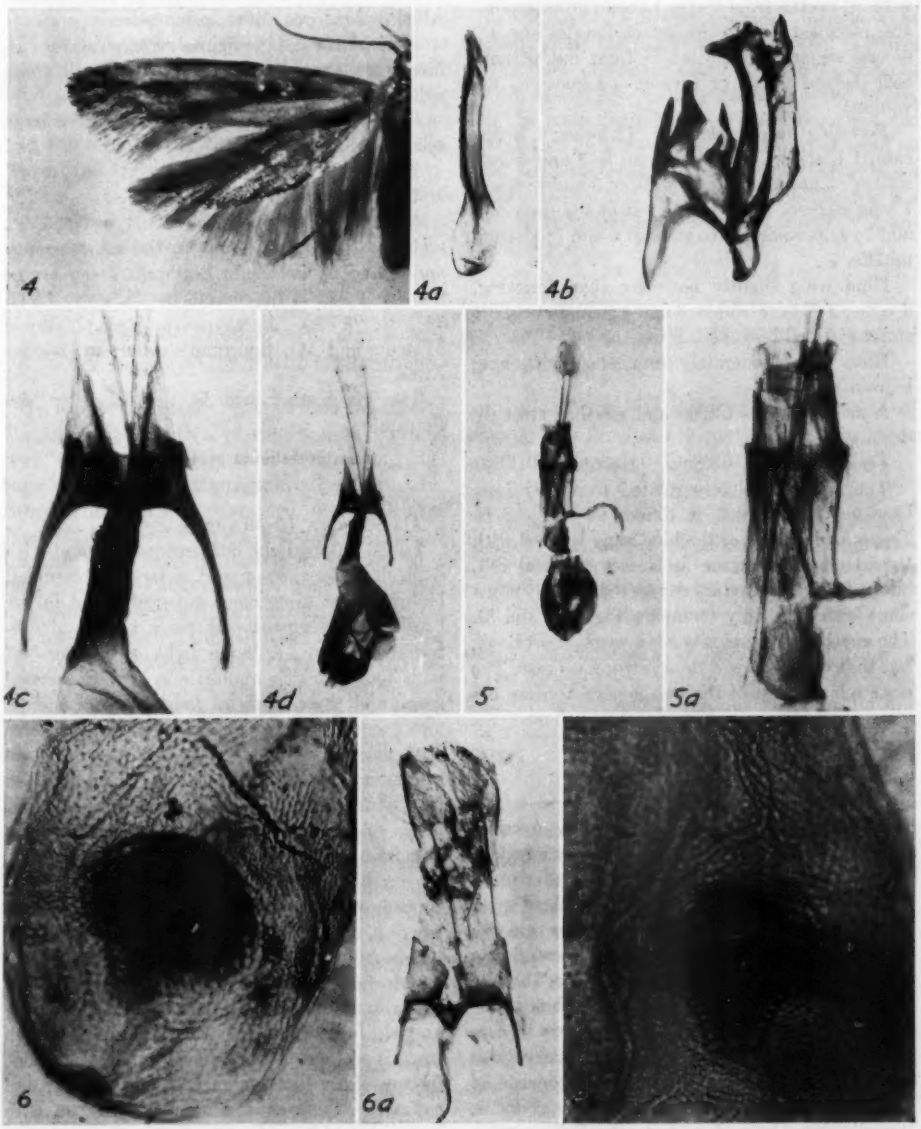
FIGS. 1–1*e*.—*Euchionodes traditionis*. n. sp.: 1, Left wings; 1*a*, lateral aspect of aedeagus; 1*b*, venation of right wings; 1*c*, lateral aspect of head to show palpus; 1*d*, eighth tergite and sternite; 1*e*, lateral aspect of male genitalia with aedeagus removed.

FIGS. 2–2*d*.—*Darlia praetexta*, n. sp.: 2, Left wings; 2*a*, venation of right wings; 2*b*, lateral aspect of head to show palpus; 2*c*, ventral view of female genitalia; 2*d*, lateral aspect of male genitalia with aedeagus in situ.

FIG. 3.—*Trypanisma prudens* Clemens: Venation of right hind wing.

Type locality.—Tigre, Argentina.

Remarks.—Described from the type ♂, 1 ♂, and 2 ♀ paratypes, all from the same locality and reared by Fernando Bourquin. Dates are as follows: Type, "V.41," ♂ paratype, "V.39"; 2 ♀ paratypes, "VII.39." Paratypes in U. S. National Museum and Mr. Bourquin's collection, Buenos Aires. Bourquin will publish the life history.



FIGS. 4–4*d*.—*Gnorimoschema cestrivora*, n. sp.: 4, Left wings; 4*a*, lateral aspect of aedeagus; 4*b*, lateral aspect of male genitalia with aedeagus removed; 4*c*, ventral view of genital plate and ostium; 4*d*, ventral view of female genitalia.

FIGS. 5–5*b*.—*Euchionodes traditionis*, n. sp.: 2, Ventral view of female genitalia; 2*a*, enlarged view of genital plate and ostium; 2*b*, signum.

FIGS. 6–6*a*.—*Darlia praetexta*, n.sp.: 3, Signum; 3*a*, enlarged view of genital plate and ostium.

Darlia, n. gen.

Figs. 2-2*d*; 6-6*a*

Typus generis.—*Darlia praetexta*, n. sp.

Head with appressed scales. Antenna simple, without pecten from scape. Labial palpus moderate, recurved, third segment as long as second; second segment roughened in front but without well defined brush or furrow. Tongue well developed.

Forewing narrow elongate, 12 veins; 1 b furcate, 1 c absent, 2 distant from 3, 3 and 4 long stalked; 5 approximate to stalk of 3 and 4; 6 and 7 long stalked, 7 to costa; 8 out of the stalk of 6 and 7; 9 approximate to stalk of 6 and 7; 11 from middle.

Hind wing slightly narrower than forewing, 8 veins; 2 distant from 3, 3 and 4 connate or short stalked; 6 and 7 stalked; 8 free.

Hind tibia moderately roughened with long hairlike scales.

Male genitalia.—Uncus and gnathos strongly developed.

Female genitalia.—Signum present.

This genus is closely related to *Trypanisma* Clemens from which it differs as follows: In *Trypanisma* vein 8 of the hind wing is fused with the base of 7, forming an accessory basal cell, but in *Darlia* the two are connected (basally) by a short crossvein only (compare Figs. 2*a* and 3). The gnathos of *Trypanisma* is a weak, short hook, but that of *Darlia* is a thick, strong process. The close relationship of the two genera appears obvious.

Darlia praetexta, n. sp.

Alar expanse 10–11 mm.

Labial palpus sordid white heavily overlaid outwardly with grayish fuscous. Antenna grayish fuscous; scape narrowly annulated with sordid white distally. Head sordid white mixed with grayish fuscous. Thorax and forewing grayish fuscous, the former considerably paler posteriorly; near middle of wing, dorsad, a large sordid-white spot; from costa, near apex, a sordid-white transverse outwardly angulate fascia extends to center, thence inwardly angulate to tornus; this fascia is sometimes incomplete and consists of costal and tornal spots; on some specimens, dorsally from base of wing to the light median spot; is a pale brownish shade; cilia concolorous with forewing, somewhat lighter dorsally. Hind wing light shining gray; cilia pale yellowish fuscous; on upper surface, at base, a conspicuous yellowish hair pencil in male, in female reduced to a few spreading hairlike scales. Legs sordid white, strongly overlaid with grayish fuscous outwardly; tarsi annulated with grayish fuscous. Abdomen fuscous above, paler beneath.

Male genitalia.—As figured. The posterior surface of the gnathos, distad, is studded with small spines. Aedeagus short and stout.

Female genitalia.—As figured. Signum a large sclerotized plate.

Type.—U.S.N.M. no. 59423.

Type locality.—Tigre, Argentina.

Remarks.—Described from the type ♂, 2 ♂, and 2 ♀ paratypes, all from the same locality and reared by Fernando Bourquin. Dates are as follows: Type, "V.39"; paratypes, 2 ♂ ♂, ♀, "VII. 39," ♀, "VI.39." Paratypes in U. S. National Museum and Mr. Bourquin's collection, Buenos Aires.

The life history will be published by Mr. Bourquin.

Gnorimoschema cestrivora, n. sp.

Figs. 4–4*d*

Alar expanse, 15–19 mm.

Labial palpus light buff; second segment with a blackish basal spot and a large subterminal blotch of the same color outwardly and in the brush; third segment with black basal and subterminal annuli. Antenna light ochraceous-buff with four blackish annuli, one slightly beyond scape and three in distal fourth. Head, thorax, and ground color of forewing light ochraceous-buff, variously marked with darker streaks and suffusion; base of tegula and forewing blackish fuscous mixed with buckthorn-brown scales, the latter color extending slightly along dorsal margin; from middle of costa to outer two-thirds a narrow black streak; from base of wing a buckthorn-brown longitudinal streak extends to apex, where it merges with the terminal black scaling; tornus suffused with buckthorn brown; cilia yellowish fuscous mixed with white-tipped black scales; underside of forewing fuscous. Hind wing grayish fuscous, slightly darker apically, with fuscous scaling on the underside; cilia yellowish fuscous. Legs light ochraceous-buff banded and suffused with fuscous. Abdomen light buff with sparse blackish scaling both dorsally and ventrally.

Male genitalia.—As figured. Note the broadly expanded terminal end of the upper arm of harpe.

Female genitalia.—Signum absent.

Type.—U.S.N.M. no. 59424.

Type locality.—Tucumán, Argentina.

Food plant.—Cestrum lorentzianum Griseb. (forming galls)

Remarks.—Described from the type ♂, 4 ♂, and 2 ♀ paratypes, all from the type locality and reared by Kenneth J. Hayward from galls on the food plant. No dates are indicated on the pin labels. Paratypes in the U. S. National Museum and the collection of the Instituto Miguel Lillo, Tucumán, Argentina.

This species is somewhat atypical for the genus having veins 3 and 4 of the forewing closely approximated, the distal end of dorsal arm of the harpe truncate and broadly triangular, and the signum absent, but these characters hardly warrant generic separation.

Gnorimoschema aquilina (Meyrick), from Peru, and *G. plaesiosema* (Turner), from Australia, New Zealand, and the Americas are the most closely allied described species. This species differs from both *plaesiosema* and *aquilina* by the absence of the subquadrate blackish costal patch. In the male genitalia *cestrivora* differs from the other two by the presence of a series of teeth on the aedeagus ventrally. The female of *aquilina* is not known, but the signum of *plaesiosema* is a strong thorn and in *cestrivora* it is absent (atypical for the genus).

ENTOMOLOGY.—*Further notes on the family Paratydeidae (Acarina), with a description of another new genus and species.*[1] EDWARD W. BAKER, Bureau of Entomology and Plant Quarantine.

In a previous paper[2] I described the family Paratydeidae, with the new genus *Paratydeus* as type. Recently, while examining material collected from soil debris by Philip W. Smith and Lewis J. Stannard, of the Illinois Natural History Survey, I found a series of minute mites which proved to belong to a new genus of Paratydeidae. The family was originally described as having no genital suckers, whereas the Illinois material has two pairs. However, the original description was based upon a single female containing an egg directly over the genital area, probably obscuring the suckers which must be present. The family definition is therefore changed to include two pairs of genital suckers and two to four pairs of genital setae. The Illinois specimens belong to a distinct genus, distinguished by the lack of eyes, by having three instead of two transverse body sutures, and by having four pairs of genital and four pairs of accessory setae instead of the two pairs of each as in *Paratydeus.*

In the previous paper the genus *Scolotydaeus* Berlese was regarded as belonging to the Tydeidae, but in view of the discovery of another related genus belonging to the Paratydeidae it is now thought advisable to remove *Scolotydaeus* from the Tydeidae and place it in the Paratydeidae with *Paratydeus* and *Neotydeus*, new genus. The three may be separated as follows.

1. Without eyes 2
   With eyes ..... *Paratydeus* Baker
2. Body divided into 3 portions by 2 transverse sutures ..... *Scolotydaeus* Berlese
   Body divided into 4 portions by 3 transverse sutures ..... *Neotydeus*, n. gen.

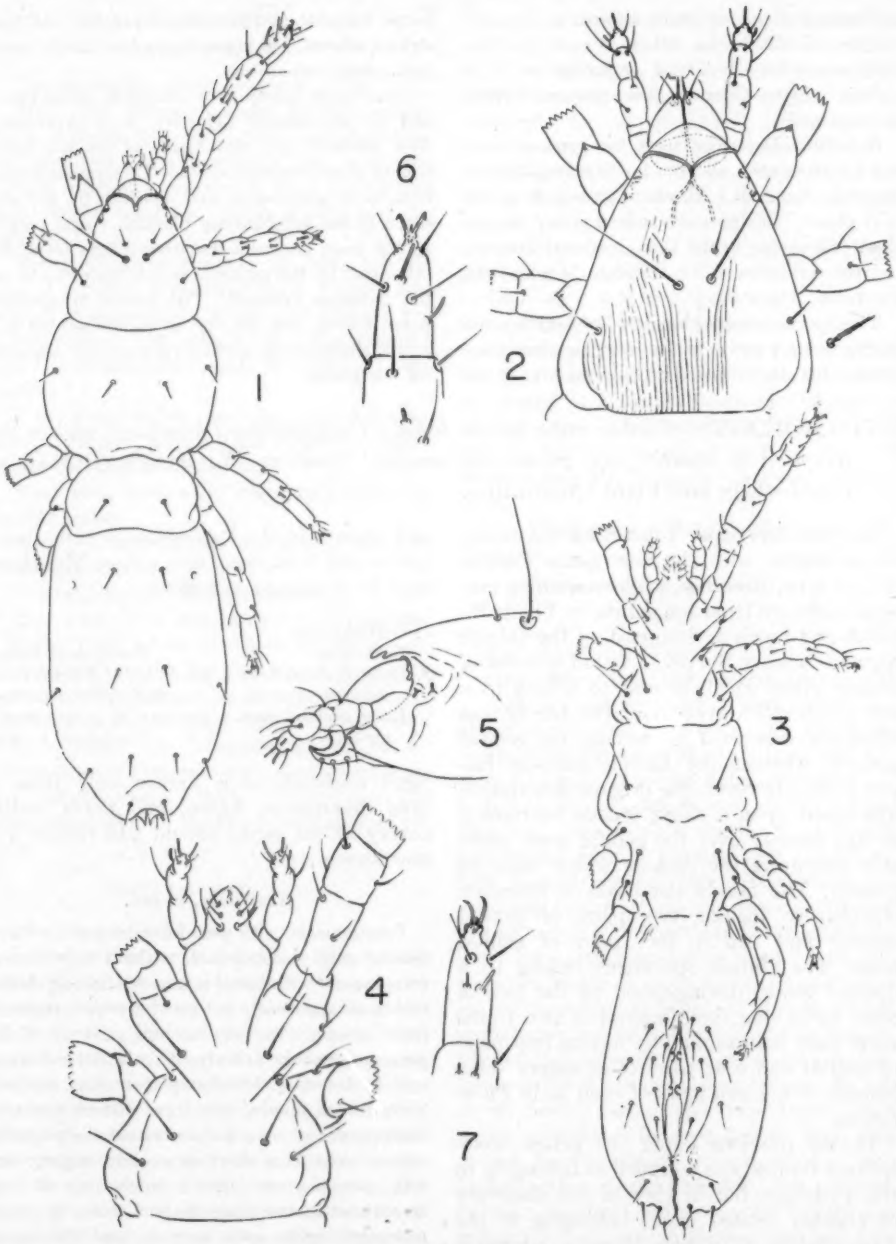
Since *Scolotydaeus* is known only from a brief description, figure, and notes, rediscovery of the genus should add details not now known.

Neotydeus, n. gen.

Prostigmatic, with pseudotracheae as in *Paratydeus;* palpi 4-segmented, without claw-thumb complex and with tarsal segment terminal; chelicera bases apparently not fused, movable segment short, strongly curved, reaching past tip of degenerate fixed chela; body elongate, propodosoma and hysterosoma without plates, skin striated; hysterosoma divided into three distinct parts by two transverse sutures just behind the posterior coxae; body setae short, lanceolate, slightly serrate, propodosoma with a single pair of long sensory setae, two pairs of short setae, two pairs of lateral peglike setae, no eyes; anal opening on venter at rear; genital opening approaching anal opening, with two pairs of genital suckers, four pairs of genital and four pairs of accessory setae; coxae I-II and III-IV in two widely separated

[1] Received June 7, 1950.

[2] Proc. Ent. Soc. Washington **51** (3) 119–122. 1949.



FIGS. 1–7.—*Neotydeus ardisanneae*, n. sp.: 1, Dorsum; 2, propodosoma and gnathosoma enlarged; 3, venter; 4, venter of propodosoma and gnathosoma; 5, lateral view of gnathosoma; 6, tarsus I; 7, tarsus II.

groups; coxae fused with body; legs sparsely haired; tarsi with two claws and a small clawlike pulvillus; tarsus I with two short rodlike setae.

Type.—*Neotydeus ardisanneae*, n. sp.

Neotydeus ardisanneae, n. sp.

Female.—Small, 366μ long; without shields, skin striate; with pseudotracheae as figured (Fig. 2); palpi (Figs. 2, 4, 5) 4-segmented, without claw-thumb complex, segment II with two dorsal setae, segment III with three setae, segment IV terminal, with three terminal rodlike setae, a lateral clublike seta, and four simple setae; cheliceral bases apparently not fused, each with a dorsal distal seta; movable chela (Fig. 5) short, heavy, strongly curved, fixed chela degenerate, not visible; venter of gnathosoma with three pairs of simple setae and a pair of lateral setae (these are the setae described as the lateral cheliceral setae in *Paratydeus alexanderi* Baker); body elongate; propodosoma and hysterosoma (Fig. 1) divided by a transverse suture; propodosoma (Fig. 2) without eyes, with a single pair of long sensory setae, an anterior pair of short simple setae, a lateral pair of serrate setae, two pairs of short lateral, peglike setae above trochanter I; hysterosoma (Fig. 1) divided into three parts by two transverse sutures behind posterior coxae; anterior portion of hysterosoma with a transverse row of four setae, middle section with two setae, and posterior section with six pairs of short setae as figured; anal opening (Fig. 3) on venter at rear; genital opening approaching anal opening, with four pairs of genital and four pairs of accessory setae, and two pairs of genital suckers; coxae in two distinct groups, fused with body; legs with a few short simple setae; all tarsi with a pair of claws and a small clawlike pulvillus; tarsus I (Fig. 6) with two rodlike sensory setae; tibia and genu I each with a single rodlike seta; tarsus, tibia (Fig. 7) and genu II each with a single rodlike seta; tibia III with a similar seta.

Male.—Not known.

Twelve specimens, all females, 1 designated as type and 11 as paratypes, were collected in leaf trash, Sanburn, Johnson County, Ill., on September 20, 1949, by Philip W. Smith and Lewis J. Stannard.

Type.—U. S. N. M. no. 1899. Two of the paratypes are to be deposited in the Illinois Natural History Survey, Urbana, Ill.

The mite is named for my daughter, Ardis Anne Baker.

ZOOLOGY.—*A synopsis of the ostracod genus* Cypricercus, *with a description of one new species from Wyoming.*[1] WILLIS L. TRESSLER, College Park, Md.

The fresh-water Ostracoda described as a new species in this report were collected from a moraine pond in the Medicine Bow Mountains of Wyoming in 1936 by Dr. Irving H. Blake, of the University of Nebraska, and were sent to the United States National Museum for identification. The genera *Cypricercus* and *Strandesia* have been somewhat confused in recent years, and as an aid to future workers in the field it has been thought advisable to make a brief synopsis of the known species of *Cypricercus*. These species, which may with certainty be referred to the genus *Cypricercus*, total 19 at the end of the year 1949.

The genus *Cypricercus* was established in 1895 by Georg Ossian Sars to include a South African species, *C. cuneatus* Sars. This form was characterized by the powerfully developed caudal rami and by the spirally coiled spermatic vessels in the male. The genus *Strandesia* Stuhlman (1888) [*Acanthocypris* Claus (1892); *Neocypris* Sars (1901)] is closely allied to *Cypricercus* Sars, and the two have been combined by G. W. Müller (1912) in one genus, *Strandesia*. It was the opinion of Sars and later of Furtos (1933) that these two genera should be kept separate. I concur in this opinion for the following reasons: (1) *Strandesia* appears to reproduce exclusively by parthenogenesis, whereas *Cypricercus* has sexual reproduction; (2) the caudal rami are more powerfully developed in *Cypricercus;* and (3) *Strandesia*, as far as is now known, is restricted to southern regions, whereas *Cypricercus* is found in both northern and southern localities. Sars (1928) has also included several species that had heretofore been included in the genus *Eucypris* and that are now held to be valid and are included in the present paper. Sharpe (1903,

[1] A contribution from the Zoology Department of the University of Maryland. Received May 25, 1950.

1908) described two new species for which he established the genus *Spirocypris*. These forms were characterized by spirally coiled spermatic vessels and unquestionably belong to the genus *Cypricercus*.

In the present synopsis I have attempted the use of the little-known formula-type key. According to Edmondson (1949) the formula-type key was invented by J. F. Meyers and was first published by Wulfort (1938) as a key for the rotifer genus *Cephalodella*. Edmondson (1949) published a formula key for the rotifer genus *Ptygura* and discussed the advantages and disadvantages of this type of key as compared with dichotomous and indented keys such as are commonly used. Edmondson gave complete directions for the preparation of formula keys in his publication. The formula key seems to be ideally adapted for use with Ostracoda.

In using the key to identify a specimen, examine the list of characters one by one, writing down the numbers of the statements that are found to be true of the specimen at hand. Strongly developed or unique characters are printed in boldface numbers. The resulting formula is then compared with the list of formulae for known species until one is found that agrees with that describing the unknown specimen. By referring to the literature cited, identification may be made positive by comparison with drawings and complete descriptions. The number in parentheses immediately preceding the species name is the number of the publication that clearly figures and describes the species in question.

The slide of the dissected specimen, from which the description of the new species reported on in this paper was made, has been deposited as a type specimen in the United States National Museum.

Genus **Cypricercus** Sars, 1895

Cypricercus Sars, Skr. Vidensk. Christiania, no. **8**: 37. 1895.
Neocypris Sars, Arch. Naturv. Christiania **24**(1): 29. 1901.
Spirocypris Sharpe, Proc. U. S. Nat. Mus. **26**: 981. 1903.
Strandesia G. W. Müller, Das Tierreich **31**: 186. 1912.
Cypricercus Sars, Crust. Norway **9**: 117. 1928.

Valves elongated, moderately compressed to tumid, higher in front than behind. Left valve projects slightly beyond right in front. Third masticatory process of maxilla with two well-developed spines. Furcal ramus long and slender but not so powerfully developed as in *Strandesia*. Reproduction by sexual means; the testis is coiled in the anterior valve chamber. Terminal claw of furca equal to about half the length of the ramus.

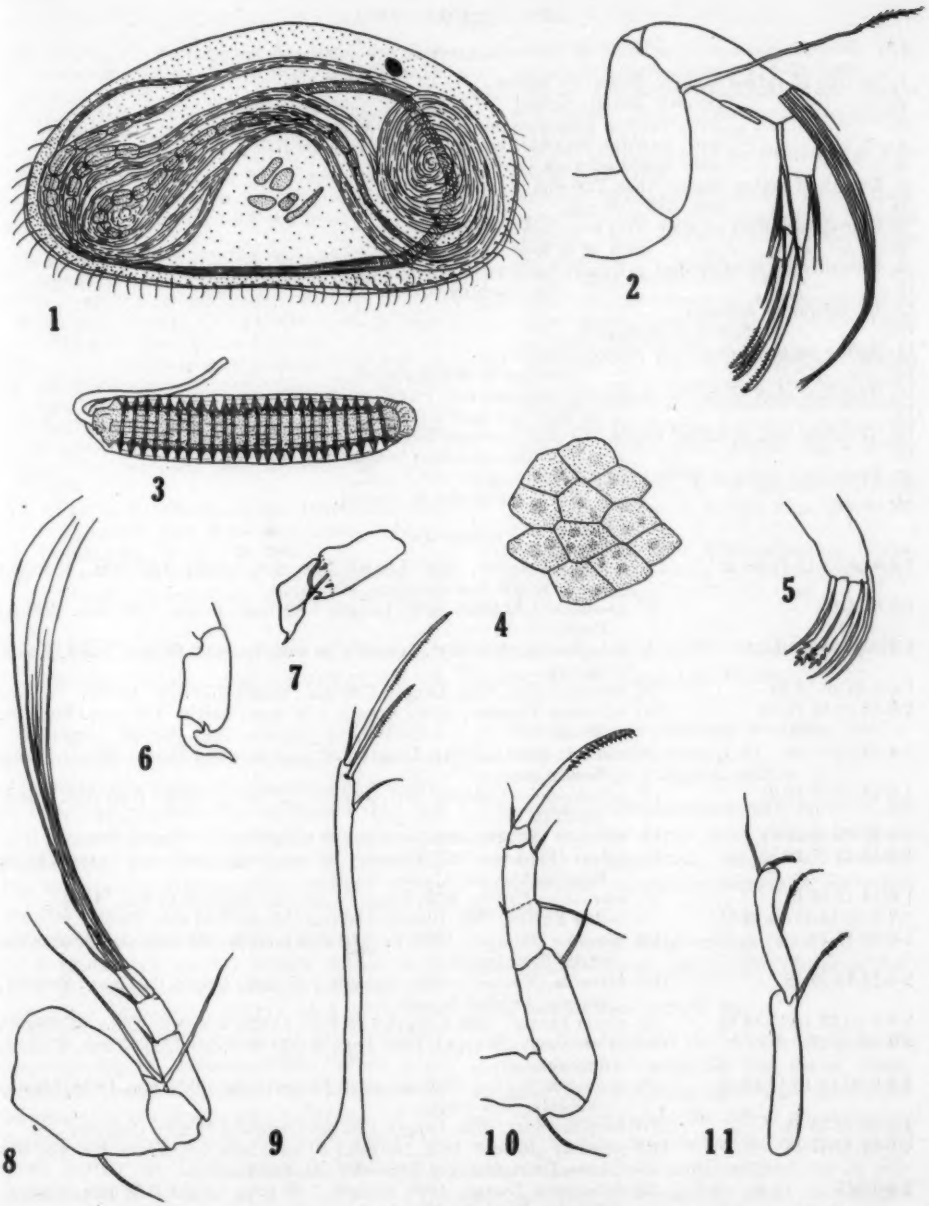
Cypricercus serratus, n. sp.

Figs. 1–11

Specific characters.—MALE from the side: Height equal to about five-ninths the length, highest in the middle, well arched dorsal margin, anterior end extremely broadly rounded, posterior end less so, ventral margin slightly sinuated in the middle, hyaline margins narrow with a few scattered hairs. From above: Moderately compressed, left valve extends beyond right in front. Surface of valves smooth, with very few hairs; a few scattered polygonal markings. Testis with marked spiral coil in anterior valve chamber connected to four bands and U-shaped coils in posterior chamber. Natatory setae of second antennae reach to tips of terminal claws. Maxillary spines heavily toothed. Prehensile palps, unequally developed, the right with propodus twice as long as greatest distal width, dactylus enlarged dorsally; left palp with propodus cylindrical, twice as long as wide, dactylus short and hook shaped. Terminal claw of first leg short and well developed with heavy spines along its distal half. Second leg typical for the genus. Furcal ramus long, slender and slightly curved; length 25 times the narrowest width, dorsal margin smooth; terminal claw equal to about half the length of the furca; terminal seta one-third the length of the terminal claw; dorsal seta slightly longer than terminal seta and removed from subterminal claw by about 1¼ times the width of the ramus. Ejaculatory duct long and cylindrical, with 24 whorls. Length 1.08 mm, height 0.69 mm.

FEMALE: Unknown.

Occurrence.—Type locality, Medicine Bow Mountains, Wyo. (moraine pond), at an altitude of 10,200 feet. Two males were taken by Dr. Irving H. Blake on July 4, 1936. Holotype, U. S. N. M. no. 90739.



FIGS. 1–11.—*Cypricercus serratus*, n. sp.: 1, Lateral view, male; 2, second antenna, male; 3, ejaculatory duct, male; 4, surface markings on valve, male; 5, masticatory process of maxilla, male; 6, left prehensile palp, male; 7, right prehensile palp, male; 8, first antenna, male; 9, furcal ramus, male; 10, first thoracic leg, male; 11, second thoracic leg, male.

KEY

CHARACTERS

1. Surface of valves smooth, delicately haired.
2. smooth, densely haired.
3. with wartlike tubercles or spines, few hairs.
4. with wartlike tubercles or spines, densely haired.
5. with raised network of reticulations.
6. Length of valves greater than 1.00 mm.
7. less than 1.00 mm.
8. Ejaculatory duct of male with less than 30 whorls.
9. with 30 or more whorls.
10. Natatory setae of second antennae reaching to tips of claws or beyond.
11. not reaching to tips of claws.
12. Furcal ramus straight.
13. curved or S-shaped.
14. Spines on third maxillary process smooth.
15. toothed or denticulated.
16. Terminal claw of furcal ramus less than one-half length of ramus.
17. at least one-half length of ramus.
18. Terminal seta of furcal ramus less than one-half length of terminal claw.
19. greater than one-half length of terminal claw.
20. Prehensile palps of second thoracic leg equally developed.
21. unequally developed.

FORMULAE

1-6-8-10-13-15-17-18-21	*serratus* Tressler, 1950. Length 1.36 mm; height 0.69 mm., moraine pond, 10,200 feet elevation, Wyoming.
1-6-8-**11**-15	(7) *episphaena* Müller, 1908. Length 1.60 mm; height 0.65 mm. Africa, Brazil.
1-6-9-13-15-16-18-21	(3) *dentifera* Dobbin, 1941. Length 2.00 mm; height 1.04 mm. Pond, Washington.
1-6-9-13-16-18-21	(9) *cuneatus* Sars, 1895. Length 1.60 mm; height 0.70 mm. Africa.
1-6-10-13-15-17-18	(16) *rotundus* Tressler, 1950. Length 1.08 mm; height 0.63 mm. Lakelet, Brazil.
1-**6**-10-13-17-18	(3) *elongata* Dobbin, 1941. Length 1.82 mm; height 0.78 mm. Ponds, lakes, Washington.
1-6-10-13-17-19-21	(3) *columbiensis* Dobbin, 1941. Length 1.27 mm; height 0.60 mm. Pond, Washington.
1-6-10-15-16-18	(12) *obliquus* (Brady, 1866. Length 1.26 mm; height 0.70 mm. Europe.
1-6-10-15-17-18	(12) *affinis* (Fischer), 1851. Length 1.20 mm; height 0.67 mm. Europe, Ohio, Illinois, Mexico, Alaska, Ontario.
1-6-13-15-16-18	(7) *maculatus* Müller, 1908. Length 1.50 mm; height 0.67 mm. Africa.
1-**7**-8-10-13-15-16-18-21	(6) *mollis* Furtos, 1936. Length 0.80 mm; height 0.44 mm. Florida.
2-6-10-17-19	(13) *passaica* (Sharpe), 1903. Length 1.60 mm; height 0.80 mm. Massachusetts, New Jersey.
2-6-**11**-**14**-16-18	(12) *hirsutus* (Fischer), 1851. Length 1.10 mm; height 0.55 mm. Sweden, Russia, Pribilof Islands.
3-6-8-10-13-15-17-18-21	(5) *tincta* Furtos, 1933. Length 1.50 mm; height 0.90 mm. Ohio, Michigan.
3-**7**-10-16-18	(14) *tuberculatus* (Sharpe), 1908. Length 0.93 mm; height 0.53 mm. Illinois, Indiana.
4-**6**-9-10-13-15-17-18-21	(5) *splendida* Furtos, 1933. Length 1.75 mm; height 0.80 mm. Ohio, Massachusetts, New York.
4-6-10-12-16-18	(11) *horridus* Sars, 1926. Length 1.05 mm; height 0.57 mm. Ontario.
4-6-11-15-17-18	(12) *fuscatus* (Jurine), 1820. Length 1.50 mm; height 0.82 mm. Europe, Illinois, Ohio, Georgia, Delaware, Massachusetts.
5-6-12-19	(2) *reticulatus* Daday, 1898. Length 1.30 mm; height 0.68 mm. Ceylon, Illinois, Virginia, Maryland.

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ZOOLOGY.—*A new species of the gorgonacean genus* Ainigmaptilon *Dean (Coelenterata: Octocorallia)*.[1]

FREDERICK M. BAYER, U. S. National Museum.

Carlgren (1943) has recently published a study of the peculiar octocorallian genera *Ainigmaptilon* Dean and *Lycurus* Molander, in which he reached the conclusion that the two are identical, with Dean's name taking precedence. At the same time he described the new species *Ainigmaptilon wallini*, bringing the number of known forms to four. He also was of the opinion that the genus should be treated as a special family rather than as a subfamily of the Primnoidae as proposed by Molander (1929), and with this view I thoroughly agree. A very distinct new species of *Ainigmaptilon*, which presents additional evidence that Carlgren's interpretation is correct, was collected for the Smithsonian Institution by Cmdr. David C. Nutt during the U. S. Navy Antarctic Expedition, 1947–48.

[1] Published by permission of the Secretary of the Smithsonian Institution. Received May 25, 1950.

Family AINIGMAPTILIDAE Carlgren, 1943

Lycurinae Molander, 1929, p. 70.
Ainigmaptilonidae Carlgren, 1943, p. 7.

Diagnosis.—Gorgonaceans with more or less strongly calcified horny axis; polyps borne on expanded, unsupported, simple or branched "polyp-leaves"; spicules as thin scales; operculum developed.

Genus **Ainigmaptilon** Dean

Ainigmaptilon Dean, 1926, p. 337; Carlgren, 1943, p. 1.
Lycurus Molander, 1929, p. 66.

As has been pointed out independently by the authors of both names for this genus, *Ainigmaptilon* bears a striking superficial resemblance to certain pennatulids: the polyps are carried on biserial, leaflike, branched or unbranched lateral outgrowths without axial support, as in *Virgularia*. This pennatulidlike effect was heightened, in the first specimen described, by the absence of a horny axis (which had probably been torn out when the colony was dredged from the

bottom). In spiculation, however, members of this genus clearly show affinity with the Primnoidae. The sclerites are thin scales, and the polyps have an operculum of eight specialized circumtentacular scales. The polyp body-scales are either arranged more or less clearly in eight longitudinal rows, or are irregularly scattered. The axis is strongly calcified and iridescent, at least in the new species here described. The stem terminates proximally in a funnel-shaped expansion which, when filled with mud, must serve as an effective anchor. This feature has been carefully described by Carlgren (1943, p. 2) for *A. wallini;* the rootlike base of *A. virgularoides* described by Molander (1929, p. 66) is also thought by Dr. Carlgren to be the remains of a funnel-like base. A well-formed funnel is present in *A. edisto*, n. sp., and it seems likely that a similar modification of the base occurs also in the other species.

Type (by monotypy).—*Ainigmaptilon haswelli* Dean.

Distribution.—Antarctic and Subantarctic, circumpolar: *A. haswelli* was taken at 66° 55′ South, 145° 21′ East, off King George V Land (512–549 m); *A. wallini* in the Ross Sea, near Discovery Inlet (550 m); *A. antarcticum* and *A. virgularoides* at lat. 64° 36′ S., long. 57° 42′ W., off Snow Hill Island (125 m) and the latter also at lat. 54° 17′ S., long. 36° 28′ W., off South Georgia (75 m); and *A. edisto*, n. sp., at lat. 65° 25′ S., long. 101° 13′ E., off Queen Mary Land (182 m).

Ainigmaptilon edisto, n. sp.

Diagnosis.—Colony unbranched; proximal end of stem furnished with a funnel-shaped expansion; axis heavily calcified, round, irregularly grooved longitudinally, light yellowish with pearly iridescence. Polyps borne on broad, bifid polyp-leaves which are opposite on the stem, in two lateral rows; opercular scales oval, with a very long, slender, smooth distal spine; no differentiated marginal (circumopercular) scales; body scales irregular, elongate, arranged longitudinally but not in eight rows. Coenenchyma of polyp leaves and stem densely packed with elongate, irregular scales.

Description.—The type (Fig. 1), a unique specimen, is broken; it consists of the base and lower part of a colony, 200 mm in length, together with 80 mm of naked axis (lacking the distal tip), and the apical 15 mm of the colony (lacking the axis);

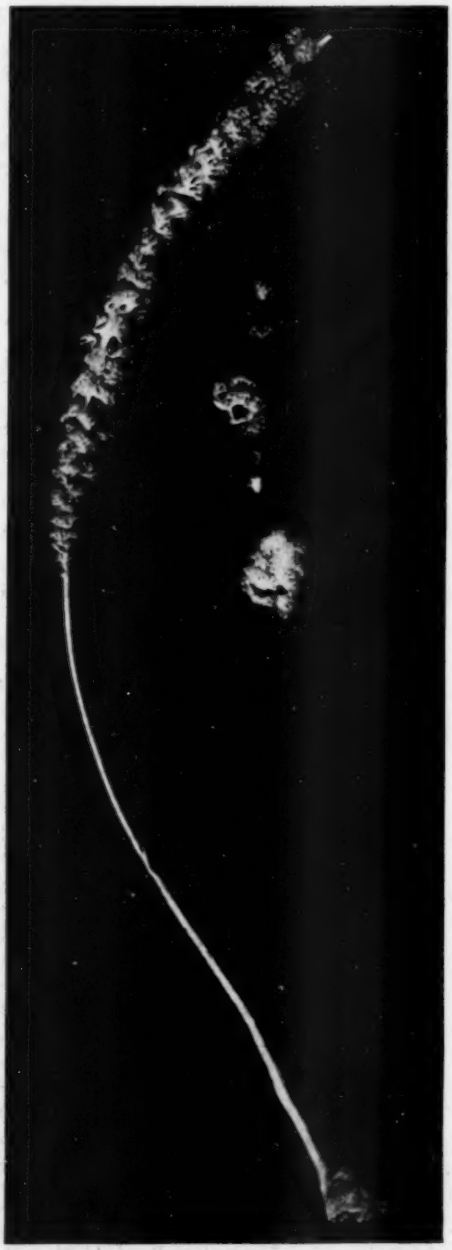

FIG. 1.—*Ainigmaptilon edisto*, n. sp.: The type specimen, about natural size. (Smithsonian Institution photograph.)

the entire colony must therefore have measured something over 295 mm in length. The polyp-leaves, which begin about 105 mm from the base, are opposite, in two series which incline a little toward one side of the axis. The leaves of the four proximal pairs are indistinctly bifid, and the polyps are placed along their free margins in a single row. The leaves of the more distally placed pairs are clearly bilobed (Fig. 2, *f*), with the polyps arranged along their free margins in two more or less distinct rows, usually numbering ±15 on each lobe. On the leaves in the distal third of the colony, extra polyps are intercalated between the two marginal rows, increasing in abundance on the more distally situated leaves until, in the terminal 15 mm, all the leaves have three rows and sometimes the beginning of a fourth. The polyps themselves (Fig. 2, *e*) are 2.5 to 3.0 mm tall from base to tip of opercular scales. The opercular spicules are well differentiated, elongate oval scales with irregularly dentate margins, sculptured with small warts, and furnished with an extremely long, smooth distal spine (Fig. 2, *a*). The body scales are irregular, elongate, finely warted but with a border practically devoid of sculpture (Fig. 2, *b*); they are arranged longitudinally, not in eight rows, closely and irregularly packed. Sclerites of similar form are found

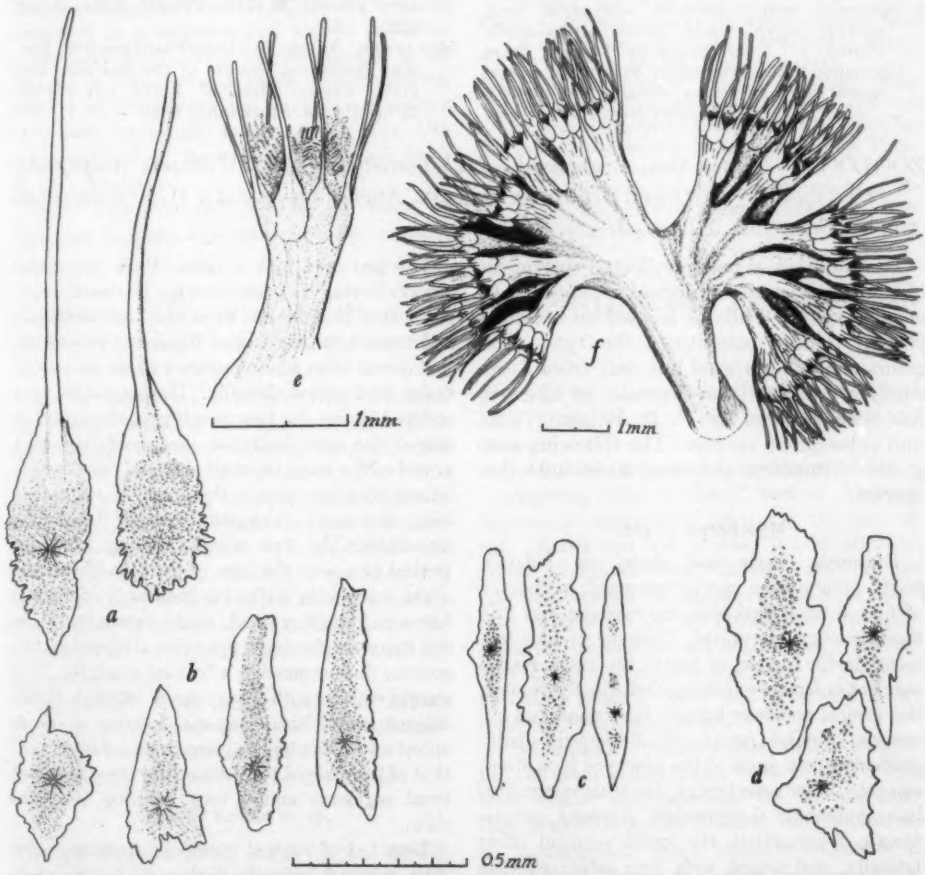

FIG. 2.—*Ainigmaptilon edisto*, n. sp.: *a–d*, Spicules (*a*, two operculars; *b*, four body scales; *c*, three scales from a polyp-leaf; *d*, three scales from the stem rind); *e*, single zooid; *f*, polyp-leaf from above the middle of colony, showing two rows of zooids on the right lobe, and an incomplete third row on the left lobe.

thickly set in the walls of the polyp-leaves (Fig. 2, *c*) and in the stem rind (Fig. 2, *d*). The color of the colony is cream white.

Type.—U. S. N. M. no. 49580.

Locality.—Lat. 65° 25′ S., long. 101° 13′ E., 100 fathoms; water temperature (surface) 30° F.; January 14, 1948, collected by Cmdr. D. C. Nutt, U. S. N. R., abroad the U. S. S. *Edisto.*

KEY TO THE KNOWN SPECIES OF AINIGMAPTILON

1. Polyp-leaves simple.
   Ainigmaptilon virgularoides (Molander)
   Polyp-leaves subdivided or branched..... 2
2. Opercular scales with prominent apical spine 3
   Opercular scales more or less acutely pointed but without a long projecting spine..... 4
3. Opercular scales strongly sculptured with thorns; apical spine stout, prominently thorny.....*Ainigmaptilon haswelli* Dean
   Opercular scales sculptured with small warts; apical spine very long, slender and smooth.
   Ainigmaptilon edisto, n. sp.
4. Opercular scales more or less regular isosceles triangles; stem rind and all surfaces of polyp-leaves filled with sclerites.
   Ainigmaptilon wallini Carlgren
   Opercular scales oval-triangular, with bluntly pointed apex; polyp-leaves with spicules only around base and on under surface; stem rind with very few spicules.
   Ainigmaptilon antarcticum (Molander)

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ZOOLOGY.—*A new genus proposed for* Lichomolgus major *Williams (Copepoda, Cyclopoida).*[1] MILDRED STRATTON WILSON, Anchorage, Alaska. (Communicated by Fenner A. Chace, Jr.)

Examination of newly collected specimens of the peocilostome cyclopoid copepod *Lichomolgus major* Williams has led to the conclusion that it constitutes the type of a genus widely separated not only from *Lichomolgus* but also from *Myicola*, to which it has been referred by C. B. Wilson (1932) and subsequent authors. The following new genus is therefore proposed to include this species.

Myocheres, n. gen.

Diagnosis.—Body not fleshy or inflated; sexual dimorphism not pronounced; metasome of five distinct segments, the cephalic and first thoracic segments united. Urosome of four segments in the female, of five in the male; genital segment of female sometimes indistinctly divided, the genital openings lateral, eggs small and numerous. Caudal rami well developed, distinguished in both sexes of the genotype by a stout, elongate, inner apical spine. Rostrum nongeniculate. Antennule 6-segmented. Antenna subprehensile, 4-segmented, the fourth segment offset laterally, and armed with long setae; clawlike spines borne on the produced portion of the third segment.

The oral area with a rather thick prominent labrum having its posterior edge produced medially rather than incised as in the Lichomolgidae; and a much thinner labium formed of two broad, juxtaposed lobes whose posterior edges are curved under and united dorsally. The mandible very reduced in size, its base roughly quadrangular in shape; the apex knoblike, posteriorly directed, armed with a small terminal claw and two posterolateral accessory pieces, the dorsal of which is a long, flat seta. Paragnaths present below the mandibles. The first maxilla arising from the ventral face near the base of the mandible, from which it is clearly distinct in both early copepodid forms and adult; a small, single segmented, sinuous structure, having a few setae arranged in two groups, thus suggesting a bilobed condition. The second maxilla with a very large, inflated, thinly integumented, basal segment, bearing a simple apical claw. Maxilliped absent in the adult female; that of the male of the lichomolgid type, with two basal segments and a long, curving, terminal claw.

Legs 1–4 of normal cyclopoid structure, with very enlarged basipods, both rami 3-segmented; the armature of the second endopod of the male modified in the genotype. Leg 5 well developed, 2-segmented, the apical segment armed with two

[1] Received July 16, 1950.

lateral outer spines, and a stout terminal spine accompanied by a slender seta; the armature of the male differing a little from that of the female.

Both sexes commensal in the mantle cavity of pelecypod Mollusca.

Genotype.—*Myocheres major* (Williams), n. comb.

Myocheres major (Williams), n. comb.

Lichomolgus major Williams, 1907: 77, pl. 3.
Myicola major, C. B. Wilson, 1932: 347, fig. 208, a-c; Monod and Dollfuss, 1934: 316.
Myicola spinosa, Pearse, 1947: 5, figs. 26–31.

A detailed description of both adult and development forms of the genotype, based upon Canadian specimens and topotypes from Rhode Island, is in preparation and will be published in the near future. This will include also a discussion of the genus *Myicola*, the systematic position of both genera and of other species that have been erroneously ascribed to *Myicola*, with a redescription of the type, *Myicola metisiensis* R. R. Wright.

Both *Myocheres* and *Myicola* are found in the common clam, *Mya arenaria*. I am indebted to Dr. J. C. Medcof, of the Fisheries Research Board of Canada, and to Dr. Fenner A. Chace, Jr., of the United States National Museum, for collections made of both of these genera. In addition, the collection upon which Pearse (1947) based his paper on the molluscan parasites from the Beaufort region has also been available. From the study of these it has been possible to establish the synonymy of *Myicola spinosa* and *Myocheres major*.

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MAMMALOGY.—*Two new shrews of the genus* Cryptotis *from Panama.*[1] HENRY W. SETZER, U. S. National Museum.

Three specimens of shrews from Chiriquí Province, Republic of Panama, referred to the United States National Museum for identification have been found to be hitherto undescribed. Two of the specimens were obtained by Dr. Eric Graetz and presented by James Zetek; the other specimen was obtained by Dr. R. K. Enders. I am indebted to Dr. H. Radclyffe Roberts, of the Academy of Natural Sciences of Philadelphia for the privilege of examining and describing the Enders specimen.

Capitalized color terms are from Maerz and Paul, *A dictionary of color* (1930). Measurements are in millimeters.

These new shrews may be known as:

Cryptotis zeteki, n. sp.

Type.—Female, adult, U.S.N.M. no. 290466; Cerro Punta (lat. 8°42′ N., long. 82°48′ W.), 6,500 feet, Chiriquí Province, Republic of Panama; obtained in April 1949 by Dr. Eric Graetz, presented by James Zetek. (Specimen in alcohol from which the skull has been removed and cleaned.)

Range.—Known only from the type locality.

Diagnosis.—Entire dorsal surface Mummy Brown, no appreciable lightening on sides or belly; hands and feet whitish; tail lighter than dorsal coloration. Skull: Dorsal surface, above posterior margin of palate, but slightly concave; canines but slightly procumbent; maxillary toothrow, especially unicuspid series, crowded until fourth unicuspid is forced out of toothrow medially; rostrum short and relatively wide; teeth but lightly pigmented.

Comparisons.—*Cryptotis zeteki* differs from *C. jacksoni* from Volcán Irazu, Costa Rica, in somewhat smaller size, especially the tail and hind foot; somewhat lighter in color; skull smaller in all measurements taken with the exception of the width of M^1, which is wider; unicuspid series more crowded; all teeth less pigmented; parietal sloping more anteriorly; entire rostrum shorter and slenderer.

[1] Received June 21, 1950.

From *Cryptotis merus*, from Mount Pirre, Panama, *C. zeteki* differs in lighter color, especially the hands and feet which are very pale; skull smaller in all measurements taken; brain case less inflated; unicuspid series more crowded; skull less concave above orbits; anterior teeth less procumbent. The two species are about the same size.

C. zeteki differs from *Cryptotis gracilis* from head of Lari River, Pico Blanco, Costa Rica, as follows: Color lighter in all respects, especially the hands and feet; skull smaller in most measurements taken; zygomatic width, width of M^1, and width of M^2-M^2 all greater; rostrum shorter and wider; unicuspid series more crowded; brain case less inflated; teeth less pigmented. The two are about the same size.

C. zeteki differs from *Cryptotis nigrescens* from Tablazo, Province of Cartago, Costa Rica, in smaller size; lighter color, including the hands and feet and in the extreme reduction of the fourth unicuspid, which, in *C. nigrescens* is still retained in the toothrow.

From *Cryptotis orophila* from Estrella de Cartago, Province of Cartago, Costa Rica, *C. zeteki* differs in uniformly darker color; more crowded toothrow; and narrower, shorter rostrum.

Measurements.—The type measures as follows (external measurements from alcoholic specimen): Total length 83; length of tail 22; length of hind foot 11; length of upper toothrow entire 8.3; zygomatic width 5.7; greatest length of skull 18.5; greatest width of skull 8.9; width of M^1 1.7; condylobasal length 18.1; width across M^3-M^3 5.0.

Remarks.—This shrew, as may be noted from the comparisons, is readily distinguishable from all other shrews from Central America by means of the extremely crowded unicuspid series.

Cryptotis zeteki appears to be most closely related, morphologically, to *Cryptotis nigrescens* from Costa Rica.

Both the type and paratype were taken by Dr. Graetz at Cerro Punta as a result of land clearing by the natives of that area.

Specimens examined.—Two, both from Cerro Punta.

Cryptotis endersi, n. sp.

Type.—Adult, skin and skull, no sex given on original label, Acad. Nat. Sci. Philadelphia no. 20955; Cylindro, Province of Chiriquí, Panama; obtained July 24, 1941, by R. K. Enders, original number 3310.

Range.—Known only from the type locality.

Diagnosis.—Entire dorsal surface Chaetura Black, no appreciable lightening on sides or belly; hands and feet blackish; tail of same color as dorsum. Dorsal surface of skull concave above orbits; rostrum long and narrow; maxillary toothrow relatively straight and uncrowded; fourth unicuspid visible in lateral view; teeth rather heavily pigmented.

Comparisons.—From *Cryptotis zeteki*, *C. endersi* differs in larger size; darker color; and longer, straighter toothrow. In all cranial measurements *C. endersi* is noticeably larger.

From *Cryptotis jacksoni*, *C. merus*, *C. gracilis*, and *C. orophila*, *C. endersi* may be distinguished by its larger size and larger skull.

From *Cryptotis thomasi*, *C. endersi* is somewhat smaller in body size and smaller in all cranial measurements taken; noticeably in the greatest width of the skull and in the length and width of the rostrum.

From *Cryptotis meridensis*, *C. endersi* is smaller in all respects, particularly in cranial measurements, in the length and width of the rostrum and the greatest width of the skull.

Measurements.—The type measures as follows: Total length 109; length of tail 36; length of hind foot 12; length of upper toothrow entire 9.4; zygomatic width 6.2; greatest length of skull 21.2; greatest width of skull 9.8; width of M^1 1.7; condylobasal length 20.2; width across M^3-M^3 5.7.

Remarks.—The type of *C. endersi* was taken in heavy forest near a rotting log by Dr. Enders in the course of zoological field work in the Chiriquí section of Panama. Morphologically, this shrew is nearest *Cryptotis meridensis* from Colombia, although the two species may be distinguished by the characters set forth under comparisons.

Latin American shrews appear to fall into two main groups, on the basis of their dental pattern. *Cryptotis meridensis* can be considered rather typical of the larger, straighter toothrow kind and *Cryptotis nigrescens* of the smaller, angular toothrow group. Additional specimens, and in particular a series of one kind from any given locality, are needed in order to define the amount of variation obtaining in shrews from Central and South America.

Specimen examined.—One, the type.

ORNITHOLOGY.—*A new race of* Parus sclateri *from the Sierra Madre del Sur of Mexico.*[1]

ALDEN H. MILLER, Museum of Vertebrate Zoology, University of California, and ROBERT W. STORER, Museum of Zoology, University of Michigan. (Communicated by H. G. Deignan.)

In the Milton S. Ray collection of birds from Guerrero, Mexico, is an excellent series of *Parus sclateri* from the Sierra Madre del Sur of that state. These at once impressed the late Mr. Ray and the senior author as distinctly more yellowish or buffy in color than *Parus sclateri* as known from the mountains surrounding the Central Plateau of Mexico. Aware of the many chances for misinterpretation of these color differences in chickadees owing to make of skin and museum age of specimen, we have made particular effort to assemble and examine all available specimens and to make comparisons between birds taken at the same time of year and in the same period of years. Further need for careful weighing of the differences was emphasized by Traylor's (Fieldiana, Zool., **31:** 272. 1949) recent inability to discern color differences between *P. s. sclateri* and *P. s. eidos* of Arizona.

A large part of the material available of this species consists of badly worn birds taken in the breeding season (April to July), poorly plumaged juveniles, or inadequately prepared specimens. Such material is essentially useless for meaningful color comparisons, which need to be carried out on fresh-plumaged birds taken in the period from September to December. Among specimens taken in the latter period, we see very little evidence of alteration in color with museum age. For example, birds taken from the vicinity of the Valley of Mexico before 1900 are essentially the same as those taken there in the past 10 years, the change, if any, being toward olive and away from purer gray in the older material. The Guerreran series has been taken in the past 13 years, but chiefly from 1941 to 1947, and its olive and yellow color would, accordingly, be expected to be at a minimum and to reflect closely the inherent condition of the birds. Moreover, the Guerreran skins, excellently prepared by W. W. Brown, have been compared with some typical *sclateri* prepared by the same collector.

[1] Received June 7, 1950.

We conclude therefore that the extremely yellowish and olive color of the Guerreran chickadees is a natural attribute of these birds and warrants description of them as—

Parus sclateri rayi, n. subsp.

Type.—Male, Mus. Vert. Zool. no. 111910, taken at Omilteme, Guerrero, Mexico, October 30, 1944, by W. W. Brown.

Diagnosis.—Similar to *Parus sclateri sclateri*, but breast Ivory Yellow rather than whitish and flanks between Grayish Olive and Olive Buff rather than Deep Olive Gray. Back often Grayish Olive and Deep Grayish Olive rather than Mouse Gray and Deep Olive Gray (capitalized color names are those of Ridgway).

Range.—Resident of the Sierra Madre del Sur in Guerrero, extending eastward into Oaxaca; also the vicinity of the Volcán de Colima in extreme southwestern Jalisco.

Specimens of P. s. rayi *examined.*—Omilteme, Guerrero, 5 (July, October, December, Mus. Vert. Zool.); Cuapongo, Guerrero, 7 (March, August, September, November, Mus. Vert. Zool.); Chilpancingo, Guerrero, 3 (March, May, Louisiana State Univ.); Cerro San Felipe, Oaxaca, 1 (August 31, U. S. Nat. Mus.); Sierra Nevada de Colima [Volcán de Colima]. Jalisco, 13 (July, September, Amer. Mus. Nat. Hist.).

The isolation of the range of *P. s. rayi* of the Sierra Madre del Sur of Guerrero from that of *P. s. sclateri* in the mountains of Michoacán, Mexico, Morelos, and Puebla by the valleys of the Río Balsas and the Río Tepalcatepec may be presumed to be a factor in maintaining and perhaps also developing the racial differences noted. To the eastward there would appear to be a possible connection of populations of this high-zone species in southern Puebla and northern Oaxaca. The single example of *rayi* from Oaxaca seems properly allocated to this race but it is not an extreme example of it; an adequate representation of the species from Oaxaca should be examined in order better to establish the range of this form in that state.

The occurrence of *rayi* in the vicinity of the Volcán de Colima is unexpected on geographic grounds. The area is close to the Pacific coast as

is the Sierra Madre del Sur, but it is separated from that sierra by the lower Balsas Valley and is connected northeastward with the highlands of Michoacán, although the connection of chickadee habitat in that direction may be tenuous. The specimens from the Volcán de Colima are distinctly yellower than the birds of Michoacán, however, and although taken in 1905, are much yellower and more olive than even older fall-taken specimens from the state of Mexico. They seem to show less of the grayish element in the yellow and olive areas than the Guerreran specimens, but we suspect this difference is due to the museum age of the skins.

The most distinctive features of *rayi* are the olive and buff hues of the underparts. Some *P. s. sclateri* approach but do not quite equal the less extreme examples of *rayi* in this respect. The juvenal plumages of the two are not fully differentiated. The differentiation in back color of the two races is not as complete as that of the ventral coloration and alone it would permit separation of little more than 50 percent of the individuals from the ranges of the two subspecies.

Dimensions of *Parus sclateri* reveal slight geographic differences suggesting a cline of increasing size northward from the Orizaba district into the race *eidos*. However, *rayi* does not seem to be significantly different from *P. s. sclateri* in this respect.

Although it is not in the province of this paper to report at length on the status of *P. s. eidos*, we do note that fresh-plumaged material of *eidos*, which we have in abundance, contrasts with topotypical material of *P. s. sclateri* from the Orizaba district and with *sclateri* from the vicinity of Mexico City in the paler, less olivaceous color of the flanks and back. The greater amount of white beneath in *eidos* is difficult to ascertain where varying makes of skin are involved, but we think this character of less significance than the color of the flanks and back. Traylor (*loc. cit.*) may have been unduly concerned with this character in his recent evaluation of *eidos*. In our view, then, *eidos* is a recognizable subspecies showing a degree and consistency of difference found in many geographic races in the Paridae.

We are indebted to the following for the use of specimens: Herbert Friedmann and the United States National Museum, John T. Zimmer and the American Museum of Natural History, George H. Lowery, Jr., and Louisiana State University, Josselyn Van Tyne and the University of Michigan Museum of Zoology, and George M. Sutton. The race of chickadee here described is named in honor of Milton S. Ray, whose extremely valuable collection of birds has become a part of the Museum of Vertebrate Zoology through the generosity of the Ray family.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

New Members of the Academy

There follows a list of persons elected to membership in the Academy, by vote of its Board of Managers, since December 1, 1949, who have since qualified as members in accordance with the bylaws. The bases for election are stated with the names of the new members.

RESIDENT

Elected December 12, 1949

Carl I. Aslakson, commander, U. S. Coast and Geodetic Survey, in recognition of his work in the development of improved methods for surveying field work, the design of charts for the Army Weather Services, and particularly the development of special methods for precise alignment and the application of electronics to the improvement and extension of precise geodetic surveys.

Harold T. Cook, senior pathologist, U. S. Department of Agriculture, in recognition of his contributions to plant pathology and in particular his research on vegetable diseases.

Howard A. Meyerhoff, permanent secretary, American Association for the Advancement of Science, in recognition of his contributions to the geology and physiography of the Western Hemisphere, particularly the geology and paleontology of the West Indies.

John A. O'Keefe, chief, research and analysis section, geodetic division, Army Map Service, in recognition of his development work in mathematics of projections, astronomical-geodetic applications, and geodetic application in guided-missile work.

Douglas L. Parkhurst, chief, instrument division, U. S. Coast and Geodetic Survey, in recognition of his long and productive career in the design and production of scientific instruments, particularly the Parkhurst theodolite.

DONALD A. RICE, mathematician, U. S. Coast and Geodetic Survey, in recognition of his excellent work in figure of the earth investigations and leadership in the project being conducted by the U. S. Coast and Geodetic Survey in the determination of the deflection of the plumb line by means of gravity anomalies.

Elected January 23, 1950

JAMES M. BLUME, soil scientist, Bureau of Plant Industry, Soils, and Agricultural Engineering in recognition of his contributions to chemical requirements of soils and, in particular, his research on atomic-energy utilization.

BERNICE E. EDDY, senior bacteriologist, National Institutes of Health, in recognition of her study of the antigenic relationship of the pneumococcic types, clarification of the nomenclature of the types, and descriptions of many new types; also for developing a method for the standardization of influenza virus vaccine and establishing minimum requirements for the regulation of the sale of influenza virus vaccine.

CHURCHILL EISENHART, chief, statistical engineering laboratory, National Bureau of Standards, in recognition of his contributions to mathematics, in particular to the techniques of statistical analysis.

ANGUS M. GRIFFIN, professor of bacteriology, George Washington University, in recognition of his important contributions toward an understanding of the coliform bacteria and his work on the antigenic analysis of red blood cells and of bacteria.

MORLEY A. JULL, head, poultry department, University of Maryland, in recognition of his research in poultry breeding.

ERNEST A. LACHNER, associate curator of fishes, U. S. National Museum, in recognition of his life-history studies of eastern United States fresh-water fishes and systematic studies of fresh- and salt-water fishes.

ELIZABETH E. SAGER, physical chemist, National Bureau of Standards, in recognition of her contributions to chemistry, particularly to absorption spectrophotometry.

JOSEPH C. SHAW, in charge of dairy-production research, University of Maryland, in recognition of his work on ketosis in dairy cattle.

W. J. YOUDEN, mathematician, National Bureau of Standards, in recognition of his contributions to chemistry and mathematics, and in particular his application of mathematical statistics to the design of experiments and the evaluation of research data.

Elected February 20, 1950

FRANZ L. ALT, acting chief, computation laboratory, National Bureau of Standards, in recognition of his contributions to applied mathematics.

VICTOR R. DEITZ, physical chemist, National Bureau of Standards, in recognition of his contributions to physical chemistry, in particular to the study of adsorption and adsorbents.

JOHN E. FABER, JR., head, department of bacteriology, University of Maryland, in recognition of his work on production and preservation of complement.

A. H. SHAPLEY, general physical scientist, National Bureau of Standards, in recognition of his work on the ionosphere and solar activity.

HOWARD E. TATEL, staff member, Carnegie Institution of Washington, in recognition of his work on the scattering of neutrons by helium and hydrogen, work in cosmic rays at extremely high altitudes with the use of rockets, and work in seismic investigations of the earth's upper crust.

WILLIS L. TRESSLER, documents officer, Central Intelligence Agency, in recognition of his significant contributions in the field of systematic zoology, ecology, and limnology.

Elected March 20, 1950

FRANK H. BABERS, biochemist, Bureau of Entomology and Plant Quarantine, in recognition of his contributions to the chemistry of insecticides and to insect physiology, with special reference to insect resistance to insecticides.

FREDERICK M. BAYER, assistant curator, division of marine invertebrates, U. S. National Museum, in recognition of his work with the marine animals of the Marshall Islands and of his special studies of invertebrates, particularly the Coelenterata.

ABNER BRENNER, chemist, National Bureau of Standards, in recognition of his outstanding contributions to the study of the electrodeposition of metals.

O. L. CARTWRIGHT, associate curator, division of insects, U. S. National Museum, in recognition of his sustained interest and comprehensive taxonomic studies of the Nearctic Scarabaeidae, particularly the subfamily Aphodiinae.

L. D. CHRISTENSON, assistant to the chief,

division of fruit insect investigations, Bureau of Entomology and Plant Quarantine, in recognition of his work in economic entomology and military preventive medicine, in particular his studies of the insect transmission of plant diseases and the field control of the vectors of human malaria.

J. A. DUERKSEN, assistant chief, section of gravity and astronomy, U. S. Coast and Geodetic Survey, in recognition of his research in geodetic astronomy and gravity, particularly in the field of pendulum observations determining dynamic temperature, flexure, and pressure corrections; and deflections of the vertical.

HELEN M. DUNCAN, geologist, U. S. Geological Survey, in recognition of her studies of fossil invertebrate animals, with special reference to the taxonomy of the Paleozoic corals and bryozoans.

FLOYD W. HOUGH, chief, geodetic division, U. S. Army Map Service, in recognition of his development and determination of precise geodetic surveys and particularly for the coordination and readjustment of the European Triangulation.

PAUL L. ILLG, associate curator, division of marine invertebrates, U. S. National Museum, in recognition of his work with the pharmacology of penicillin and for physiological and taxonomic studies of invertebrate animals, copepod Crustacea in particular.

EDWARD J. PROSEN, senior chemist, National Bureau of Standards, in recognition of his outstanding contributions to thermochemistry and chemical thermodynamics.

GROTE REBER, radio physicist, National Bureau of Standards, in recognition of his pioneer work in radio astronomy.

JAMES H. SCHULMAN, head, luminescent materials section, Naval Research Laboratory, in recognition of his work in solid state chemistry and physics, particularly his studies of the luminescence of solids.

BOURDON F. SCRIBNER, chief, spectrochemistry section, National Bureau of Standards, in recognition of his outstanding contributions to applied spectroscopy, especially in the field pertaining to atomic-energy materials.

HENRY W. SETZER, associate curator, division of mammals, U. S. National Museum, in recognition of his studies of the distribution and taxonomy of mammals, the kangaroo rats in particular.

C. A. TRUESDELL, consultant in applied mathematics, Naval Research Laboratory, in recognition of his outstanding contributions to pure and applied mathematics.

JAMES A. VAN ALLEN, physicist, John Hopkins University Applied Physics Laboratory, in recognition of his contributions to nuclear physics, the development of proximity fuzes and particularly for his research on the physics of the upper atmosphere by means of high-altitude rocket studies.

Elected April 17, 1950

WILLIAM R. CAMPBELL, mechanical engineer, National Bureau of Standards, in recognition of his contributions to engineering mechanics and in particular his researches on the characteristics of wire-resistance strain gauges.

J. H. CURTISS, chief, national applied mathematics laboratories, National Bureau of Standards, in recognition of his contributions to pure and applied mathematics and in particular for his effective introduction of statistical methods in naval engineering and his creation and administration of a strong federal program in applied mathematics.

W. H. W. KOMP, sanitary engineer director (entomologist), National Institutes of Health, in recognition of his research on tropical mosquitoes and his outstanding service in the suppression of diseases transmitted by them.

RANDALL K. LATTA, entomologist, Bureau of Entomology and Plant Quarantine, in recognition of his studies of insect biology and methods of insect control, in particular his researches on fumigation with methyl bromide.

SAMUEL L. MADORSKY, research chemist, National Bureau of Standards, in recognition of his research in physical chemistry and in particular his development of methods to separate stable isotopes and his research on thermal dissociation of polymers.

LOUIS C. MCCABE, chief, office of air and stream pollution, Bureau of Mines, in recognition of his work on the geology and utilization of coal and in particular his distinguished service in improving Army coal procurement methods and coal-mine operations after the Allied invasion of Germany.

ALBERT E. MCPHERSON, mechanical engineer, National Bureau of Standards, in recognition of his contributions to engineering mechanics and in particular his researches on the behavior of aircraft structures under static and dynamic loads.

JOSÉ OITICICA FILHO, entomologist, Museu Nacional, Rio de Janeiro, Brazil (temporarily in Washington, D. C.), in recognition of his researches on the taxonomy and distribution of the Lepidoptera, with particular reference to the Saturniidae, Sphingidae, and related families.

CHESTER H. PAGE, electronics consultant, National Bureau of Standards, in recognition of his outstanding contributions to the theory and development of radio-proximity fuzes and their countermeasures and to the understanding of vacuum-tube oscillators.

THERON P. SAGER, chemist, National Bureau of Standards, in recognition of his studies of the permeability of films of natural and synthetic polymers to gases.

A. C. SMITH, curator, division of phanerogams, U. S. National Museum, in recognition of his contributions to plant taxonomy, especially to knowledge of flowering plants of tropical America, Asia, and the Pacific.

HARRY H. STAGE, assistant chief, division of insects affecting man and animals, Bureau of Entomology and Plant Quarantine, in recognition of his investigational work on the habits and control of insects affecting human health and for his highly successful presentation of the results of such work in a style appreciated by the general public.

ROBERT D. STIEHLER, chief, testing and specifications section, organic and fibrous materials division, National Bureau of Standards, in recognition of his research in the field of chemistry and technology of rubber and in particular his theories of the mechanism of the vulcanization of rubber, and also for his work on the oxidation and reduction of organic compounds of biological importance.

DOUGLAS R. TATE, physicist, National Bureau of Standards, in recognition of his contributions to engineering mechanics, and in particular his researches on hardness, force, and strain measuring equipment.

LEO A. WALL, chemist, National Bureau of Standards, in recognition of his contributions to high-polymer chemistry, and in particular for his studies of copolymerization and the structure of polymers.

Elected May 15, 1950

H. R. BIRD, in charge, poultry investigations, Bureau of Animal Industry, in recognition of his research in the field of poultry nutrition, especially as regards the role of vitamin B_{12} on hatchability of eggs and on viability and feathering of chicks.

RAYMOND M. GILMORE, biologist in charge, whale investigations, Fish and Wildlife Service, in recognition of his valuable contributions to the ethnozoology of South America, to the systematics of Arctic mammals, and to the biology and habits of whales and their relatives.

JOHN L. HAGUE, chemist, National Bureau of Standards, in recognition of his contributions to analytical chemistry, in particular the application of instrumental and spectrophotometric methods to metallurgical analysis.

GERSON KEGELES, physical chemist, National Cancer Institute, in recognition of his contributions to physical chemistry and in particular for his development of an optical method for the study of diffusion and sedimentation.

H. A. THOMAS, physicist, National Bureau of Standards, in recognition of his contributions to atomic physics, in particular his work on the proton moment, value of e/m, and other atomic constants.

CHARLES WEIR, physicist, National Bureau of Standards, in recognition of his contributions to the physics of leather and rubber and in particular his studies of the kinetics of the shrinkage of collagen.

ALFRED H. YEOMANS, technologist, Bureau of Entomology and Plant Quarantine, in recognition of his investigations on the behavior of small particles in wind tunnels and of the techniques for applying insecticides, especially those studies related to the atomizing of liquids.

NONRESIDENT

Elected December 12, 1949

PERRY BYERLY, professor of seismology, University of California, Berkeley, Calif., in recognition of his contributions to theoretical and practical seismology, with special reference to the study of northern California earthquakes.

B. GUTENBERG, director, seismological laboratory, California Institute of Technology, Pasadena, Calif., in recognition of his contributions to theoretical seismology.

H. N. HANSEN, associate professor of plant pathology, University of California, Berkeley, Calif., in recognition of his work in plant pathology and mycology, especially for his notable contribution to the development of the concept of the "Dual Phenomenon" in Hyphomycetes.

WILLIAM C. SNYDER, associate professor of plant pathology, University of California, Berkeley, Calif., in recognition of his outstanding contributions toward an explanation of the mechanism of variation in imperfect fungi, particularly with respect to heterocaryosis and the "Dual Phenomenon" in Fusarium.

Elected March 20, 1950

CARROLL F. MERRIAM, hydroelectric engineer, Pennsylvania Water & Power Co., Baltimore, Md., in recognition of his intensive studies and engineering applications of hydroelectricity, hydrology, rainfall, run-off, ground water, and geodetic control surveys.

Elected May 15, 1950

LLOYD E. ROZEBOOM, associate professor of parasitology, Johns Hopkins University, Baltimore, Md., in recognition of his numerous and outstanding contributions to medical entomology especially those concerning the biology and classification of mosquitoes important to human health.

G. W. WHARTON, associate professor of zoology, Duke University, Durham, N. C., in recognition of his contributions to the biology and classification of invertebrate animals, especially chigger mites important in the transmission of disease.

PHILOSOPHICAL SOCIETY

1319TH MEETING

The 1319th meeting was held in the auditorium of the Cosmos Club, October 23, 1949, President JOHNSTON presiding.

Program: T. E. ALLIBONE, Associated Electrical Industries in England: *Lightning.*—Benjamin Franklin, "the father of lightning," first drew attention to the similarity of the electric fluid from a friction machine with that drawn from the thundercloud.

Photography with high-speed rotating lenses has shown that a flash is generally composed of three or more separate strokes occurring within a second of time; that the first stroke is formed by a pilot streamer steadily progressing to the earth with a speed of over 10^7 cm/sec; and that this is reinforced every 50 microseconds by a "stepped leader" shot from the cloud until the pilot streamer reaches the earth. Then the main stroke flows at 10^9 cm/sec, up from ground to cloud, discharging with currents averaging 20,000 amperes lasting for 25 microseconds. The charge is deposited from the cloud down the network and tracery of the leader stroke.

If a tall building, such as the Empire State Building in New York, is below the thunder clouds, the leader-stroke process may rise from ground to cloud. If buildings of less height are struck it is likely that an upward-directed leader will rise to meet the downward-advancing leader stroke, but there are no photographs of this extent. A few records at ground level shows evidence of upward leaders rising from ground for some meters.

Measurements of field charges at great distances, from or near to thunderclouds, support the general picture given by photography. Pilot-streamer and stepped-leader stroke processes have been recorded in laboratory sparks, and interesting differences between positive and negative sparks have been recorded, but there is no photograph of a positive lightning flash.

Oscillographic and other records on transmission lines have given information regarding the amplitudes and direction of currents in strokes. The main stroke, lasting up to 100 microseconds, can be well correlated in detail with the luminosity time characteristic of the stroke. In addition, the oscillograph shows the existence of a "confirming stroke" a low current discharge lasting milliseconds at the order of 100 amperes often over the whole period between successive strokes in a flash.

Field-charge measurements disclose that the upper positively charged regions of a cloud are discharging at low rate after the manner forecast by C. T. R. Wilson, thus supplying from all the storms in progress over the globe, the few 1,000 amperes necessary to maintain the heaviside layer. Bomber flights over clouds have confirmed such currents. (*Author's abstract.*)

1320TH MEETING

The 1320th meeting was held in the auditorium of the Cosmos Club, November 5, 1949, President JOHNSTON presiding.

Program: JOHN S. HALL, U. S. Naval Observatory: *The matter of interstellar space.*—A brief survey was presented of studies made to determine the nature of interstellar material during the past 45 years. Since Hartmann's classic discovery of the presence of interstellar calcium in 1904, many investigations have been carried on both here and abroad.

Several gaseous clouds, hundreds of light years in extent, have been outlined from a study of their absorption lines in the spectra of stars. Emission spectra of gases in the vicinity of very hot stars in many parts of the sky have been observed. Hydrogen is by far the most prevalent element in interstellar space; oxygen, calcium, sodium, potassium, titanium, and neutral iron are also present. The molecules CN, CH, and CH+ have been identified.

The distribution of solid particles appears to be very erratic near the plane of the galaxy; these particles are comparable in size to a wavelength of light. Much larger particles—meteors, micrometeorites, and meteorites—are being constantly encountered by the earth.

Theoretical discussions have indicated that some of the smaller particles may be ferromagnetic. Fermi has recently postulated the existence of magnetic fields as contributory to the origin of cosmic rays. Polarization of starlight recently observed at the Yerkes and Naval Observatories may be due to selective scattering by ferromagnetic particles whose long dimension is parallel to magnetic lines of force in galactic space.

After allowance has been made for the obscuration caused by interstellar material, astronomers conclude that the size of our galaxy is only about twice that of its nearest counterpart—the Andromeda nebula. The Solar System is about 30,000 light years from the galactic center. (*Author's abstract.*)

1321ST MEETING

The 1321st meeting was held in the auditorium of the Cosmos Club, November 19, 1949, President JOHNSTON presiding.

Program: F. D. HENDRICKS, Food and Drug Administration: *Antibiotics.*—The discussion was limited to the five antibiotics certified by the United States Food and Drug Administration. The following topics were discussed with regard to each antibiotic: (1) Historical aspects; (2) important physical and chemical aspects; (3) the use of each drug in the diseased states; (4) general discussion.

The most important antibiotic is pencillin. It was discovered "accidentally" by Fleming in 1927. Its possibilities were not realized for 10 years. World War II and the requirements of United States troops made it a No. 1 priority study. The development of a better strain of the organism producing penicillin and the change in the method of culture from surface to the deep tank have made it possible to produce penicillin at enormous yields and at low prices.

General characteristics of streptomycin were discussed. Its chief use, i.e., in the treatment of exudative tuberculosis, was pointed out.

The discovery of bacitracin was accompanied by promise of its use in human infections. Its toxicity to the mammalian kidney when given by injection has limited its use to topical and oral administration. It produces excellent results in this manner with a minimum of sensitivity developing.

Aureomycin was called the "wonder drug of 1948" by some investigators. It is produced by an ultramold. Its activity against all bacteria has a wide range. Its potentialities are not yet realized.

Chloramphenicol was also the product of an ultramold, and its history and uses more or less parallel those of aureomycin, although less is known about it. It is less toxic than aureomycin. Its use against typhoid has produced encouraging results. (*Author's abstract.*)

1322D MEETING

The 1322d meeting, the 79th annual meeting, was held in the auditorium of the Cosmos Club, December 3, 1949, President JOHNSTON presiding.

The report of the Treasurer, LAWRENCE A. WOOD, showed an income for 1949 from dues and investments amounting to $1,818.17. Expenditures for the year amounted to $1,526.79, leaving a surplus of $291.38. The current expenses increased from $2.83 per member in 1948 to $2.86 per member in 1949. The total estimated assets of the Society as of December 1, 1949, were $17,215.85 as compared with $15,655.67 on December 1, 1948. The Auditing Committee reported that the Treasurer's records and report were correct.

The joint report of the Secretaries was read by the Recording Secretary, Mr. MAHAN. This report showed a net gain of 9 new members during the year and an active membership of 531 on December 1, 1949.

The report of the Committee on Elections showed that the following officers had been elected for the coming year:

President: F. C. KRACEK.
Vice Presidents: E. U. CONDON, A. G. MCNISH.
Recording Secretary: A. E. RUARK.
Treasurer: L. A. WOOD.
Members at Large of the General Committee: S. E. Forbush, B. L. Wilson.

In the general discussion from the floor, a motion was made to change the meeting night from Saturday to Friday. This motion was defeated. A motion suggesting that the membership be sent a preferential ballot carried.

Program: J. A. HIPPLE, National Bureau of Standards: *Precise measurement of atomic masses.*— The history and development of mass spectrograph methods for measuring atomic masses were traced from Aston's first instrument in 1919 up to the present. Those in addition to Aston making major contributions to this field of mass spectrography were, according to the speaker, Dempster, Bainbridge, Jordan, Mattauch, and Nier. Some results of mass measurements and the packing effect found in various atoms and the accuracy of mass measurements with these instruments were discussed.

One of the newly elected vice presidents, Mr. MCNISH, was asked to serve as the representative for the newly elected President, Mr. KRACEK, who was ill. Mr. MCNISH was escorted to the rostrum by Past Presidents SILSBEE and STIMSON and was given the gavel by President JOHNSTON. Mr. MCNISH expressed his appreciation for the honor bestowed upon him as the personal representative for Mr. KRACEK and after announcing that the next meeting would be addressed by DEAN BURK, of the National Institutes of Health, adjourned the meeting for the social hour at 10:13 P.M. (*Secretary's abstract.*)

1323D MEETING

The 1323d meeting was held in the auditorium of the Cosmos Club, December 17, 1949, President KRACEK presiding.

Program: DEAN BURK, National Institutes of Health: *Thermodynamic aspects of photosynthesis.*— The efficiency of the energy transformation "chemical energy gained per light energy absorbed" in photosynthesis by *Chlorella pyrenoidosa* has been found to attain a maximum of at least 65–85 percent (3–4 quanta of red light per molecule of O_2 produced or CO_2 consumed). These high efficiencies were measured not only with low light intensities below the compensation point and for short periods of time (minutes) but also with light intensities five to twenty times the respiration-compensation intensity in experiments lasting many hours. At such intensities red light (630–660 mu) was shown not to affect respiration *per se*, either autocatalytically or stoichiometrically, by photoreduction of respiratory intermediates, so that thermodynamic allowance for respiration during photosynthesis could be made unambiguously, or eliminated altogether, in calculating the photosynthetic yield. In carbonate buffer (pH 9) the efficiency was only one-half to one-third as great as in culture medium at pH 5, and intermediate efficiencies were obtained in bicarbonate medium at pH 7. The assimilatory quotient (CO_2 consumed/O_2 produced) averaged-1.05 + 0.25, without evidence of notable CO_2 outburst immediately upon illumination or inburst upon darkening. The nearly perfect conversion of light energy into chemical energy in photosynthesis assures the potential importance of this process as a future source of energy. (*Author's abstract.*)

1324TH MEETING

The 1324th meeting was held in the auditorium of the Cosmos Club, January 14, 1950, President KRACEK presiding.

The retiring president, FRANCIS E. JOHNSTON, George Washington University, delivered his presidential address on the subject *The theory of group representations.* After a few brief remarks about the history and development of groups, some of the simpler fundamental operations involving the product of elements, such as their associative properties, the identity operation, and the inverse operation, were presented. Using these fundamental operations, the speaker then derived and discussed various types of groups. As examples an element and all its powers or sets of nonsingular matrices were shown to be groups. Group theory itself, according to Mr. JOHNSTON, began with a study of permutations. Examples of permutations and groups that were derived from such permutations were also presented. The latter part of the lecture was devoted primarily to matrices, matrix operations, matrix transformations, and the types of groups and representations that could be derived from such operations. Numerous examples of groups and group representations were presented in the form of slides. (*Secretary's abstract.*)

This address will later be published in complete form in this JOURNAL.

1325TH MEETING

The 1325th meeting was held in the auditorium of the Cosmos Club, February 11, 1950, President KRACEK presiding.

Program: R. E. LAPP: *Modern explosives and the national security.*—The peak in the rising curve of weapon development will be reached when the hydrogen bomb is developed. Fusion-type weapons, as contrasted with uranium fission bombs, derive energy from the fusing of hydrogen atoms into helium atoms, releasing 20 Mev of energy per fusion. Conventional U^{235} fission releases 200 Mev per fission, but the explosive violence of the reaction is limited by critical size of the assembly. Fusion weapons are not restricted by any critical size and can conceivably be made to be the equivalent of 1 million tons of TNT (i.e., a 1 megaton bomb). Even larger bombs might be made, but these would not find "compatible targets" since the 1 megaton bomb is already so destructive that it would find application only against very large cities.

Mr. LAPP stressed the fact that no H-bomb has been made and that many technical difficulties lie ahead. There is even the possibility that the thermonuclear reaction may not be realizable or if realized would engender serious difficulties in transportation to the target system. Possession of the H-bomb by another country would give her an enormous advantage over this country. Not only would it have the advantage of a surprise blitz against vastly more vulnerable targets, but also it would be able to evacuate its own cities prior to our own retaliatory effort. The existence of many cities of appropriate size and attractiveness to the H-bomb should be a compelling reason for serious consideration of the dispersal of our populations.

The speaker emphasized the fact that although it was a scientific possibility for 10 to 15 million of our citizens to become casualties overnight it was a far cry from this being a political probability. He urged public discussion of the H-bomb and its effects. In this connection, Mr. LAPP felt we had already wasted five years because of a futile policy of secrecy on the A-bomb and that an immediate prospectus on the H-bomb was required to stimulate thinking on the subject. Mr. LAPP presented his own prospectus on the bomb, giving areas of expectable damage from heat, blast, and penetrating radiation. He noted that the danger of persistent or prolonged radioactivity in the case of an H-bomb was correspondingly much less than for atomic weapons. (*Author's abstract.*)

Mr. WALTER RAMBERG, of the National Bureau of Standards, presented an informal communication entitled *Distortion of a section* of bent wire.

1326TH MEETING

The 1326th meeting was held in the auditorium of the Cosmos Club, February 25, 1950, President KRACEK presiding.

Program: J. R. PELLAM, National Bureau of Standards: *Recent experiments in liquid helium II.*—The subject of liquid helium II was introduced by means of a short motion-picture film illustrating some of the more unusual properties of the substance. For example, the λ-point transition from the helium I state to the helium II state was demonstrated by showing the sudden cessation of boiling as the temperature dropped below the critical 2.19°K. Other manifestation of the peculiar thermal properties of liquid helium II were illustrated, including the so-called "fountain effect." For the fountain effect, heat was shown applied to the upper portion of a capillary immersed in liquid helium II with the resultant formation of a jet or fountain of the liquid. All these phenomena are forms of the general thermomechanical property of liquid helium II, wherein thermal and mechanical processes are inseparably related.

Perhaps the most physically significant aspect of the thermomechanical effect is the ability of the liquid to support thermal waves. These temperature waves, known as "second sound," conform to the wave equation and thus travel with a characteristic definite wave velocity. They can be set up as standing temperature waves in resonant chambers or can be pulsed as packets of heat progressing through the liquid. Microphones are not activated by second sound, and so detection must ordinarily be accomplished by means of temperature sensitive devices.

In recent experiments at the Bureau of Standards, second sound has been detected and measured mechanically for the first time. Although no net pressure fluctuation or net mass flow accompanies the waves, currently proposed theories of helium II suggest that an "internal" kinetic energy density should exist. Thus, whereas microphones are insensitive (recognizing pressure fluctuations or particle velocity), the device known

as the Rayleigh Disk responds to the presence of this kinetic energy and is accordingly activated by second sound.

Other recent experiments include the measurement of second sound velocity at temperatures attainable by adiabatic demagnetization, i.e., below 1°K. The observed strong increase in wave velocity at these lowest temperatures has theoretical significance with respect to the current two-fluid hypothesis of liquid helium II. (*Author's abstract.*)

1327TH MEETING

The 1327th meeting was held in the auditorim of the Cosmos Club, March 11, 1950, President KRACEK presiding.

Program: W. F. G. SWANN, Bartol Research Foundation: *Trends of thinking in modern physics.* —The lecture comprised the philosophic discussion of the nature of physical theories as they have developed from the pre-Galilean period to the present day.

A theory is a means of deducing one set of circumstances from another. A good theory is one in which, by saying few things, we can deduce many consequences. A poor theory requires the giving of many things as a start and in its worst form is nothing but a compilation of information. The idea of a model is extraneous to the purpose of a theory, but it is essential to any theory that one shall be able to realize a one-to-one correspondence between the elements of the theory and something in the mind.

Sophistication in physical theories is good, but semisophistication can breed illusions of valueless content.

The lecture was illustrated by examples from celestial mechanics, atomic structure, the quantum theory, and the theory of relativity, and a brief discussion of the significance of a unified field theory was given. (*Author's abstract.*)

1328TH MEETING

The 1328th meeting was held in the auditorim of the Cosmos Club, March 25, 1950, President KRACEK presiding.

Program: BRUCE H. BILLINGS, Baird Associates: *Right and left in physics.*—What was meant by right and left in physics was first demonstrated by an image inversion on the screen obtained by reversing a colored slide in the projector. The primary right and left which concerned the speaker, however, was that of optical activity in crystals, liquids, and various proteins. These materials were referred to as circularly anisotropic and have the property of rotating the plane of polarization of incident plane polarized light. The birefringent properties of crystals of ammonium dihydrogen phosphate and quartz were illustrated by projecting the interference rings on the screen which appear when these crystals are placed between crossed polaroids in a diverging beam of mercury light. Patterns were shown for right- and left-handed crystals and for a combination of the two. The most outstanding demonstration of the evening was that of making a uniaxial crystal of ammonium dihydrogen phosphate function as a biaxial crystal when placed between crossed polaroids in a diverging beam of mercury light. This was done by first coating surfaces of the crystal with a transparent conducting film and then applying about 10,000 volts in a direction parallel to the crystal axis. (*Secretary's abstract.*)

1329TH MEETING

The 1329th meeting was held in the auditorium of the Cosmos Club, April 8, 1950, President KRACEK presiding.

Program: J. R. ZACHARIAS, Massachusetts Institute of Technology: *Molecular beams.*—A discussion was given of the advantages of combining the mass spectrograph with a molecular beam apparatus. A new double-focusing mass spectrograph designed for the purpose of obtaining high abundance resolution was described. It was indicated that it is possible to work with concentrations of rare isotopes of 1 part in 10^7 in quantities of less than a millimicromole of material. (*Author's abstract.*)

Mr. A. G. MCNISH, of the National Bureau of Standards, presented an informal communication on *The relation between critical penetration frequencies for the F layer and the phases of the moon as observed above Peru and Trinidad.*

1330TH MEETING

The 1330th meeting was held in the auditorium of the Cosmos Club, April 22, 1950, President KRACEK presiding.

Program: J. HILLIER, RCA Laboratories: *Present status of electron microscopy.*—Some of the newer developments of the instrumentation of electron microscopy were described, including in particular an auxiliary intermediate lens for increasing the range of magnification of the conven-

tional electron microscope and a new small permanent magnet instrument, which is particularly useful for research problems that do not require the ultimate in resolving power. Some of the more recent refinements in the electron optics of the larger electron microscopes were also described and a number of micrographs demonstrating resolutions in the range 10A-20A were shown.

Newer specimen techniques for use in the study of microorganisms and viruses were described. In general, these involved an attempt to examine the material with a minimum of manipulation. In the technique which most nearly satisfies all of the requirements, the organisms are grown under semiarid conditions directly on the membrane which subsequently supports the specimen in the instrument. The only treatments to which such specimens are subjected is a final desiccation in air.

Recent developments in the sectioning of tissues involve the use of a reservior on the microtome knife to permit obtaining serial sections. Reduction of static friction in the microtome, the elimination of vibration and the compensation of thermal changes permit sections of known thickness to be cut with a high degree of accuracy. By means of serial sections, it was shown that the only subsequent treatment to which the sections could be subjected was no treatment at all.

In conclusion it was pointed out that the electron microscope provides single instantaneous photographs of a given specimen and that electron microscope images alone do not enable a worker to follow the detailed morphological changes which can occur in a complex biological system. To do this it is necessary to devise suitable independent experiments. (*Author's abstract.*)

1331ST MEETING

The 1331st meeting was held in the auditorium of the Cosmos Club, May 6, 1950, President KRACEK presiding.

Program: A. PARKER, Fuel Research Center, London, England: *Fuel research in Great Britain.*—It was pointed out that England's primary fuel is coal and that oil and gas are virtually nonexistent. Prior to World War I not much research was done on fuels. However, at the close of this war it was realized that the coal supply might eventually become low, and steps were taken to conserve it. A Fuel Research Center was established in 1919, and since that time fuel research has grown until now there are separate organizations for coal, coke, gas, and electricity. Each of these activities has also been brought directly under government control so as to further conserve the usage of fuels.

The Fuel Research Center, at which the speaker is the director, works on a wide variety of fuel problems. The physical and chemical properties of coal have been surveyed. Coal has also been utilized in the making of gas and oil. More economic methods of burning coal in which the coal is circulated and burned under pressure have been investigated. Boilers have been developed that burn coal without smoke. These have been particularly useful on ships in the British fleet. The subject of domestic heating has also been studied with the help of a calorimetric house having radiometric recording devices in each of the rooms. (*Secretary's abstract.*)

President KRACEK announced that the General Committee as a result of the vote of the membership had decided that meetings of the Society starting in October would be held on alternate Fridays rather than on alternate Saturdays.

1332D MEETING

The 1332d meeting of the Society was the occasion of the nineteenth Joseph Henry Lecture and was held in the auditorium of the Cosmos Club, May 13, 1950, President KRACEK presiding

Program: WILLIAM SHOCKLEY, Bell Telephone Laboratories: *New phenomena of electronic conduction in semiconductors.*—Attention was drawn to the methods used for explaining conduction in semiconductors and to the older and newer experiments in this field. The older experiments described were conductivity measurements, Hall Effect measurements and conductivity measurements using radioactive antimony. By a combination of these three experiments, it is possible to determine the sign of the conducting particle and thus to establish whether the conduction was by electrons or holes. The newer experiments mentioned were the Haynes and Suhl experiments and the work on transistors. These newer experiments were of particular significance, since it is now possible by injection methods to introduce either holes or electrons into known semiconductors and determine their mobilities and paths in electric and magnetic fields by the use of probes. In the work on transistors it was found possible to obtain a rectifying action by placing an n-type semiconductor in contact with a p-type.

Upon contact, there is a potential developed which urges the electrons in the direction of the p-type semiconductor thus creating a resulting rectifying action. (*Secretary's abstract.*)

This lecture will be published in detail later in this JOURNAL.

1333D MEETING

The 1333d meeting was held in the auditorium of the Cosmos Club, May 19, 1950, President KRACEK presiding.

Program: D. H. MENZEL, Harvard Observatory: *The sun and the universe.*—Records from a unique-type solar telescope are opening up new studies of the effect of the sun on the earth. In the early 1930's M. Bernard Lyot, a French astronomer, designed and built an instrument that he called a coronagraph and that has made it possible to photograph and study the solar prominences as well as other coronal effects.

The field of radiocommunication has contributed further to the study of solar effects in its effort to determine and eliminate the effects of certain atmospheric disturbances which hamper communication. It has been determined that the ionosphere, a series of "layers" of ionized gas lying 70 to 100 miles or more outside the earth's surface, have much to do with these disturbances, that the ionization is caused directly by ultraviolet radiation from the sun.

It is difficult to ascribe terrestrial disturbances to specific solar phenomena. Mr. Dellinger, formerly chief of the Central Radio Propagation Laboratory of the National Bureau of Standards, has found, however, a direct relationship between solar flares and radio fadeouts. Motion-picture records of solar disturbances and study of the changes of such solar features as sunspots, prominences, flares, and the coronal spectra are being used to clarify the relationship between sun and earth.

The "spicules," expanding jets of gas at the solar poles, are under investigation as the source of the coronal material and of matter reaching the ionosphere. Studies of vagaries in weather and of solar and galactic radio noise augment the search for a predictable relationship between variations of solar and terrestrial activity. (*Author's abstract.*)